INDUSTRIAL ARTS and VOCATIONAL EDUCATION

Vol. 22
No. 5

PUBLISHED MONTHLY BY THE BRUCE PUBLISHING COMPANY, 524-544 NORTH MILWAUKEE STREET, MILWAUKEE, WISCONSIN.
Eastern Office: 40 E. 34th St., New York, N. Y.— Western Office: 66 E. South Water St., Chicago, Ill.

CONTENTS

The Annual Requisition, *by Paul C. Hoopes* 181
Industrial-Arts Supplies, *by Byron M. Taylor* 183
Outline of Printing Course, *by Leo E. Schmitz* 186
Keeping Up the School Printshop, *by Herbert Warfel* 189
Editorials 190
Ornamental Concrete Work, *by E. G. Livingston* 192
Senior-High-School Electricity, *by I. G. Terry* 193
A Trade-Term Test, *by George Roberts* 2A

Supplements

Crowfoot Stand, *by W. A. DeVette* No. 265
How Well Do You Know Your Triangles? *by D. E. Kellogg and W. A. DeVette* No. 266

Problems and Projects

Crowfoot Stand, *by W. A. DeVette* 195
A Leather Desk Set, *by Ross C. Cramlet* 195
Scenery Construction, *by H. B. Kellam* 196
Ash Trays, *by H. M. Andersen* 198
Method for Driving Threaded Work Between Centers, *by Frank D. Rohmer* 198
Track Hurdle, *by M. L. Klein* 199
Lawn Chair, *by E. W. Baxter* 200
How Well Do You Know Your Triangles?, *by D. E. Kellogg and W. A. DeVette* 200
A Safe Method for Jointing a Circular Saw, *by Maurice L. Bullard* 200
Full-Length Window Screen, *by John F. Faber* 200

Associations and Conventions 7A
School Shop Equipment News 9A

THIS ISSUE

This is the Annual Requisition Number of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION. Those interested in the subject of requisitions will be delighted with the article on "The Annual Requisition" by Paul C. Hoopes, and "Industrial-Arts Supplies" by Byron M. Taylor.

The woodworking teacher who is confronted with the task of preparing scenery and stage settings for graduation programs will find helpful suggestions on "Scenery Construction" by H. B. Kellam.

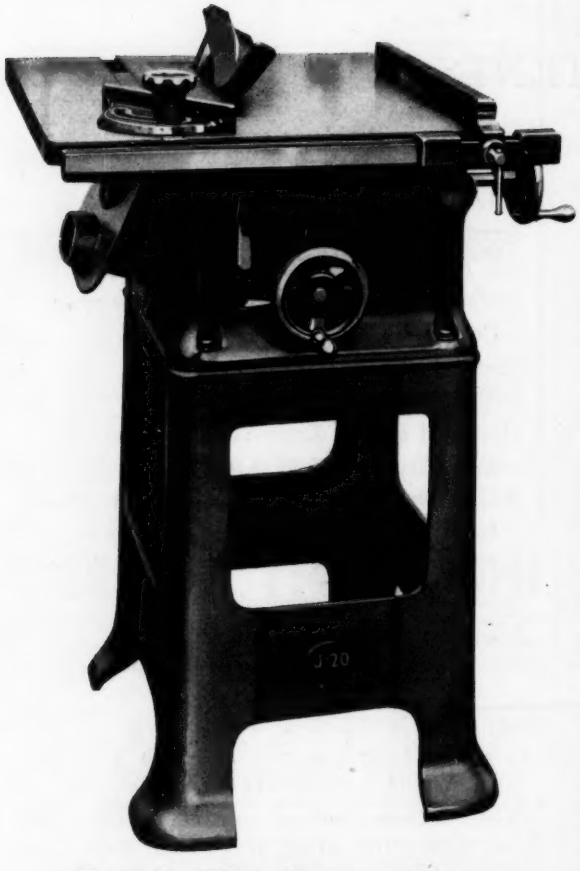
THIS MONTH'S COVER

The picture used on our cover this month shows a painting which adorns the walls of Mr. William S. Kienholz's office at Los Angeles, California. Mr. Kienholz is Supervisor of Vocational Education at Los Angeles.

The picture was painted by one of the art students of the Frank Wiggins Trade School from suggestions submitted by Mr. Kienholz. It depicts in a forceful way the work of guidance so necessary to the youth of today.

Articles Indexed—The articles contained in the Magazine are regularly indexed in "The Reader's Guide to Periodical Literature," and "Education Index."
Entered Jan. 2, 1914, as second-class mail matter at Milwaukee, Wis., under Act of March 3, 1879. Copyright, 1932, by Bruce Publishing Co. Title registered as Trade Mark in U. S. Patent Office, Nov. 25, 1930.
Subscription Information—Subscription price, $2.50 per year, payable in advance. Canadian postage and tariff, $1.00, foreign countries, 50 cents. Copies not over three months old, 25 cents; more than three months, 50 cents. Notices for discontinuance of subscription must reach Publication Office in Milwaukee, at least fifteen days before date of expiration. Changes of address should invariably include old as well as new address. Complaint of nonreceipt of subscribers' copies cannot be honored unless made within fifteen days after date of issue.
Editorial Contributions.—The Editors invite contributions bearing upon Industrial Arts, Vocational Education, Manual Training, and related subjects. Manuscripts, drawings, projects, news, etc., should be sent to the Publication Office in Milwaukee. Contributions are paid for at regular space rates. In all cases manuscripts should be accompanied by full return postage.
The Magazine is on sale at Brentano's, New York; Wanamaker's, Philadelphia; Brentano's, Chicago; Philippine Education Co., Manila, P. I.

Our contribution to the *New Deal!*



J-20 Variety Saw

Totally enclosed, dust-proof motor mounted directly on tilting saw arbor. Cast iron table smoothly finished. Throat plate for dado work. Cut-off and rip gauges. Easy adjustments.

THE school shop executive and instructor are getting a "new deal" in the new Yates-American school line of woodworking machines. The accumulated experience of years building industrial machines has been put into these new tools. They are smaller than the usual standard size of factory equipment, but point for point — quality, durability, similarity of control, productive ability, ease of adjustments, safety—they are equal to their big brothers in all respects, save price.

The new school line comprises the variety saw illustrated here and a scroll band saw, single surfacer, hand jointer, hollow chisel mortiser and borer, speed lathe, oscillating spindle sander, disc and belt sander, disc and drum sander and grinder.

We will gladly send you, upon request, complete details concerning the machine illustrated here or any other in which you may be interested.

YATES-AMERICAN

YATES-AMERICAN MACHINE COMPANY

Rochester, N. Y. BELOIT, WISCONSIN, U. S. A. Hamilton, Canada

INDUSTRIAL ARTS and VOCATIONAL EDUCATION
May, 1933
Vol. 22, No. 5

The Annual Requisition

Paul C. Hoopes

High School,
Roselle, New Jersey

To write a clear-cut, definite requisition is an art of which every shop teacher ought to be a devotee. Requisitions, properly written, add much to the efficiency with which the school shop ought to be conducted.

THE modern tendency is to conduct school business just as other well-regulated business is conducted. This means that the requisitions for school and shop supplies may no longer be the specimens of cabalistic writing which they so frequently were in years gone by. It was the immortal Bobby Burns who gave utterance to the desire that we might see ourselves as others see us. What a revelation some of those who pass out half-organized supply orders would have if they knew what the salesmen and business men really thought of them.

Take the case of the industrial-arts instructor who is requisitioning, say, $500 worth of equipment and supplies. How will his list, which fills seven or eight sheets of paper, appear to the merchant. Catalog numbers are given for some items, manufacturers' names rarely appear, sizes follow no set or established order of arrangement, and many items lack all specifications except name and amount needed.

"How in blazes do I know whether these varnish brushes are to be rubber set, grade A, white bristle, or a cheap article? This just says '6 1-inch varnish brushes,' " growls the merchant. "Doesn't the darned fool know there are upwards of 80 varnish-brush manufacturers all making a variety of grades?"

"Here is another bad one: '5 lb. ¾-inch brads.' Wonder what gauge number they should be?"

"And these hack-saw blades; how many teeth to the inch should they have?"

"One ream No. 1 sandpaper." "Well, I better take the lower of the two grades I have. A fellow that doesn't know any more about what he wants than this one does, won't know good from bad."

"And this glue; no name — just cabinet glue. Better give him that 15-cents-a-lb. variety."

And so continues the more or less profane soliloquy through the whole list.

In due time the rewritten and fully specified list (rewritten and specified by the hardware merchant) is submitted with prices to the board of education. The board's main interest in it is to compare prices with those submitted by other competitors. Its members do not know, and care less, that the firm submitting bid No. 2 is out to win and therefore are cutting quality wherever possible. The board merely sees that the firm that sent in bid No. 2 is the lowest bidder and the award is made on price. Possibly the successful firm is from a large city near by where the policy of sales is somewhat elastic, and a sale made at any profit, no matter how small, is looked upon as a salesman's coup. Every advantage has been taken of the unspecified list by this firm, while a reliable local concern depending upon satisfaction as a recommendation for future business rewrote the order in a conscientious manner and lost the bid on price.

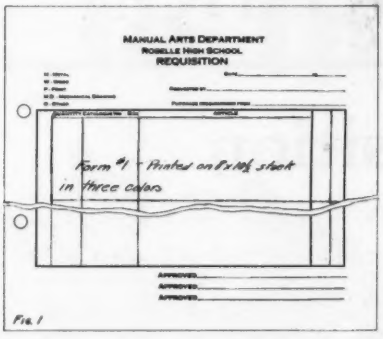
In a case of this kind a justified resentment is felt toward the board of education and also toward the author of the list of supplies. Someone spent a day or more making up the bid, writing for new prices, locating items not carried regularly, and so on, but all to no avail. The local firm is peevish about it. "Don't they pay taxes; isn't this their town?" If they had had a fully specified list they could have kept the business in town, and so on, and so forth.

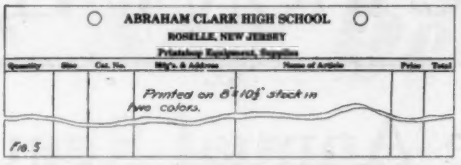
This is always a dangerous sort of snowball to start rolling. It may turn into an avalanche at the wrong time. No public work can afford to have the ill will of the public, especially during such times as the past two or three years of depression. Industrial-arts departments have been closed in the name of economy in this state during the past year and no doubt others will meet a similar fate in the future. This is a step in the wrong direction. It behooves all who are engaged in this work to guard against conveying the impression to any of the public that the shop teacher can be classed with the "know-it-alls," "nit-wits," and "dumb-bells."

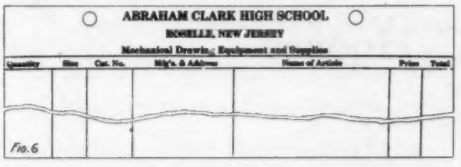
A requisition must be put on a basis that can't be criticized. The instructor who writes it must know his stuff. He must know the multiplicity of variations found under the generic name of almost any article

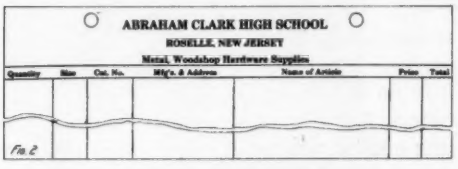
that he may require. To know that a certain company manufacturing nails, tacks, staples, etc., offers to the consumer a list of over 20,000 items is to appreciate the inanity of writing an order for just "carpet tacks" or "fence staples."

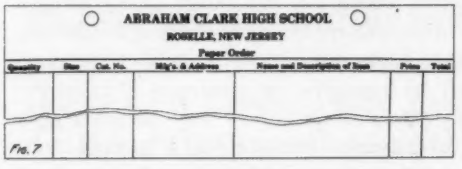
the better understanding of the production and sales of those items which the instructor places on his orders. It is well to study foreign trade, especially the imports including tariff regulations. The source of many a mysterious ingredient will be discovered through this

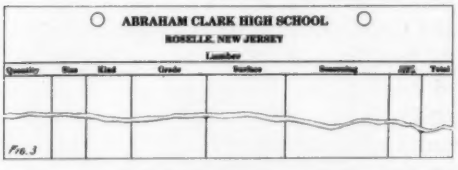


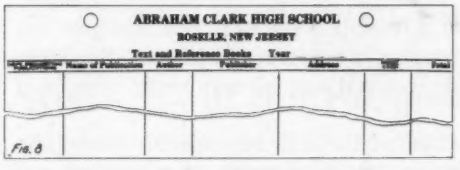

ABRAHAM CLARK HIGH SCHOOL
ROSELLE, NEW JERSEY
Printshop Equipment, Supplies
Quantity Size Cat. No. Mfg's. & Address Name of Article Price Total
Printed on 8x10½ stock in two colors.
Fig. 5

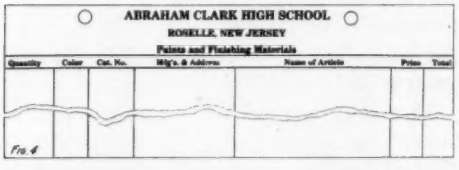

ABRAHAM CLARK HIGH SCHOOL
ROSELLE, NEW JERSEY
Mechanical Drawing Equipment and Supplies
Quantity Size Cat. No. Mfg's. & Address Name of Article Price Total
Fig. 6

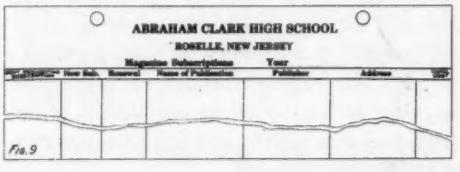

ABRAHAM CLARK HIGH SCHOOL
ROSELLE, NEW JERSEY
Metal, Woodshop Hardware Supplies
Quantity Size Cat. No. Mfg's. & Address Name of Article Price Total
Fig. 2


ABRAHAM CLARK HIGH SCHOOL
ROSELLE, NEW JERSEY
Paper Order
Quantity Size Cat. No. Mfg's. & Address Name and Description of Item Price Total
Fig. 7




ABRAHAM CLARK HIGH SCHOOL
ROSELLE, NEW JERSEY
Text and Reference Books Year
Name of Publication Author Publisher Address Price Total
Fig. 8


ABRAHAM CLARK HIGH SCHOOL
ROSELLE, NEW JERSEY
Paints and Finishing Materials
Quantity Color Cat. No. Mfg's. & Address Name of Article Price Total
Fig. 4


ABRAHAM CLARK HIGH SCHOOL
ROSELLE, NEW JERSEY
Magazine Subscriptions Year
New Sub. Renewal Name of Publication Publisher Address Price
Fig. 9

Systematic filing of literature, annuals,[1] and catalogs is therefore one of the first steps toward perfecting an ordering system. Quick accessibility to this material also is required, and the superintendent who furnishes his teachers with filing cabinet, folders, etc., has a right to expect them to be used. Taking a day off once a season to excavate this material out of a desk drawer is not often enough. Matter of such importance should be put into its proper place in the cabinet as received.

When requisition time approaches, decide upon your requirements in a definite fashion. This may take somewhat deeper study and analysis than appears on first reflection. Appreciating the endless variety of items available for the simplest use, is apt to create a fear that there is certain to be an error in any choice. Familiarity helps brush away this idea. Make at least a superficial study of the commodities offered. Visits to manufacturing plants of all kinds give one a glimpse behind the scenes. The results of this kind of observation are varied but all have a pronounced professional benefit, being sociological, industrial, mechanical, and commercial. Broadening contacts are most essential to channel. The continuous collecting, filing, and reading of commercial advertising and good-will literature is of value in a limited way. Much of this is excellent in its informative values, although some of it tells only a portion of the story or distorts the truth for selfish ends.

Then there is the little matter of systematizing a method of presenting a correctly written and specified requisition. The plain sheet of paper still used extensively for requisitions is sometimes all that is necessary, but more often it is not. Usually such a piece of paper disappears in the maw of a filing tray in the office. The materials requested will then be received any time, some time, or never. This period of waiting becoming irksome, a duplicate is sent in. Perhaps, *just perhaps,* this second piece of paper has better luck, and the items are received. Later the original comes to light and soon the mystified shopman receives a duplicate order. Much sputtering and confusion takes place; no one knows how it happened, and the blame most likely is placed on the teacher anyway.

The order blanks accompanying this article have been designed to eliminate some of the most glaring errors. They furnish a simple check-up system. Figure

[1] *School Shop Annual*, published by the Bruce Publishing Co., Milwaukee, Wis.

1 shows a current order blank. It is put up in pads, punched for loose-leaf notebook filing, and printed on three colors of stock. Each instructor has his own supply of blanks. If he needs five gallons of gasoline, he writes out the blank in triplicate and hands two copies to his superior. After this official has approved it, he retains one copy, and sends the remaining sheet to the purchasing agent, usually through the principal's or superintendent's hands. The fact that a printed form is used carries an element of formality, and the orders command respect.

Figures 2, 3, 4, 5, 6, 7, 8, and 9 are for yearly orders. These are printed on two colors of stock. One color is for the assembled order, the other for departmental orders. In operation the scheme is simple. Each shop instructor writes his order, filling in all columns for every item and using the proper form for his various needs. Periodicals, books, paints, etc., are listed on separate sheets. These sheets are then handed to the department head, who checks and consolidates all of the like kinds of materials into one list on a proper sheet. For example, periodicals for the various departments will go to the purchasing agent listed on one sheet marked "Periodicals." The originals from which the composite orders are made are handed back to their makers and are used to check incoming materials.

Last but far from least, yearly orders and current orders should always be typed, then checked for errors. Usually there are plenty, especially if typed by someone who is not familiar with the sizes and materials used in school shops. Handwritten orders are the most prolific sources of errors.

It is time to adopt a systematic and orderly manner of making out school-shop requisitions. It will surely lead to a better feeling and greater respect between the school, the manufacturer, and the merchant. Above all it will aid in more efficiently training the youth of America.

Industrial-Arts Supplies

Byron M. Taylor

Instructor in Electricity,
Herbert Hoover Senior High School,
San Diego, California

Carelessness in the use of school-shop supplies not only spells waste and inefficiency, but also neglects to inculcate valuable thrift habits in the student.

Under the term supplies are grouped all those consumable materials used by the shop teacher and the student for demonstrations, experiments, and the building of projects. Supplies, unlike tools, machines, and permanent fixtures, are not subject only to "wear and tear." They are transient, and stores or stocks of them must be accumulated and periodically replenished.

Perhaps the harshest and most justifiable criticism now being made against the industrial-arts department is that of the mounting cost of supplies. Though the per capita cost must necessarily be high, and much of its recent increase may be laid to the enlarged scope of the courses, it is unfortunately true that there is much waste of materials in our school shops. The method described herewith for using, handling, and distributing supplies will eliminate much of this waste, and may silence those who are saying that excessive cost makes many of our subjects unjustifiable.

Supply or Requisition Lists

These should be standardized for each department in the school system and should be printed on standard forms. Figure 1 shows a typical sample of the standard requisition forms used by the San Diego city schools in their electrical shops. These lists are printed in quadruplicate on paper of contrasting colors. One copy goes to the purchasing agent, another to the school principal, a third to the central warehouse, and the fourth is retained by the instructor. These lists were compiled by the electrical shop instructors of San Diego, working under the supervision of the industrial-arts director, Mr. E. F. Landon. They contain only those materials which are used enough to warrant buying in large quantities and storing in the central warehouse. Special and occasionally used materials are ordered on regular school requisition forms.

Stockroom

Individual tools are kept by the students in the bench drawers, general tools are placed on wall panels, and special tools are kept in the instructor's cabinet. There is, therefore, very little need for a toolroom. Occasional tools and supplies are stored in a stockroom, equipped with shelves and cabinets that all materials may be systematically arranged. This facilitates handling and enables a new student to soon learn the "system."

Stockroom Clerks

Taking care of the stockroom provides valuable experience for the student, but the difficulty is that so few students welcome responsibility or have the desire or ability to successfully do work of this sort. There also is the difficulty in finding boys who are conscientious in handling materials, especially if the material is given out to particular friends.

For this reason it is well to appoint two students to take care of the stockroom because one acts as a check upon the other. Each student stays on duty two weeks, but the schedule is so arranged that both students do not go out of service at once. There is a "new man" at the beginning of each week, and there is always an "old head" on duty to train and supervise him. The novice is dubbed the "Helper" while the student who has had a week's experience is given the title of "Clerk." This remains the order of succession. Besides filling the *students' requisitions* and keeping the *permanent inventory* the clerks are expected to keep everything in its place, and to keep the room neat and clean; the latter obligation includes sweeping the floor.

Student's Requisition

It goes without saying that correct procedure in handling materials upon the part of the individual student demands that he make out a complete requisition for each project begun. Where he has to make out a written order for his material, he is impressed with its cost and is thus encouraged to economize. Furthermore, he is thus conforming to the standard practice followed in industry. Bills of material or requisi-

tion blanks are an aid to the stockroom clerks and to the instructor in collecting for materials used.

Figure 2 shows a student's shop requisition designed and used by the author. It is printed in duplicate on heavy paper (notebook size), of contrasting colors. The student fills out both copies for each job or project he does. For either to be valid or to be honored by the stockroom clerk, the original must bear the instructor's signature in the proper column. Thus, the instructor can enforce neatness, good spelling, and correct mathematics. The student keeps the original in his notebook or in his job sheet, and the duplicate he turns in to the stockroom clerk who gives him the required articles and then files the requisition. Additions must be added to both copies. Whenever possible the student makes out his requisition in full for each job before getting any material. This stimulates careful planning and constructive thinking on his part, and in addition conforms to standard industrial practice. Where units of stock are such that they can easily be purveyed, the clerk does the entire job of filling the requisition. However, where there is much sawing or cutting to be done, the large piece of stock will have to be given out to the student, allowing him to take what he needs and return the stock piece.

Original 1 — San Diego City Schools — Inventory Clerk Copy

ELECTRIC SHOP REQUISITION

School _____ Date _____

Quantity on Hand	Stock Check	Quantity Wanted	Unit	Description	Per Selling Unit Price	Per Selling Unit Quantity	Price Per Buying Unit	
			Gal.	Acid—Hydrochloric (Com.)	.15	Pint		
			Gal.	Acid—Sulphuric (Com.)	.15	Pint		
			Shts.	Aluminum—16 ga.—12x72	.0031	Sq. In.		
			Shts.	Aluminum—20 ga.—12x72	.00203	Sq. In.		
			Shts.	Aluminum—24 ga.—12x72	.0014	Sq. In.		
			Only	Anchors—Screw—3-16x1	.013	Each		
			Yd.	Asbestos—Sheet—1-16"	.0001	Sq. In.		
			Only	Bells—All Metal—6V	.35	Each		
			Doz.	Blades—Hacksaw—Flexible—Back half hard—10"—16T	.0333	Each		
			Doz.	Blades—Hacksaw—Flexible—10"—18T	.0417	Each		
			Doz.	Blades—Hacksaw—Flexible—10"—32T	.0333	Each		
			Box	Bolts—RH Stove (100 in box) 1/8x1	.0021	Each		
			Box	Bolts—RH Stove (100 in box) 3-16x3/4	.0015	Each		
			Box	Bolts—RH Stove (100 in box) 1/4x1	.0023	Each		
			Box	Bolts—FH Stove (100 in box) 1/8x1	.0023	Each		
			Box	Bolts—FH Stove (100 in box) 3-16x3/4	.0015	Each		
			Box	Bolts—FH Stove (100 in box) 1/4x1	.0023	Each		
			Lb.	Brads—Wire—16 ga.—1"	.09	Lb.		
			Shts.	Brass—Half Hard—16 ga.—24x96	.0027	Sq. In.		
			Shts.	Brass—Half Hard—22 ga.—24x96	.0023	Sq. In.		
			Shts.	Brass—Half Hard—26 ga.—24x96	.0016	Sq. In.		
			Shts.	Brass—Half Hard—28 ga.—24x96	.0012	Sq. In.		
			Lgth.	Brass—Round—6 ft. lengths—1-16"	.00097	Inch		
			Lgth.	Brass—Round—6 ft. lengths—1/8"	.0018	Inch		
			Lgth.	Brass—Round—6 ft. lengths—3-16"	.0039	Inch		
			Lgth.	Brass—Round—6 ft. lengths—1/4"	.0069	Inch		
			Shts.	Brass—Spring—30 ga.—12x96	.0007	Sq. In.		
			Pkg.	Bushings—Conduit—Galv.—1/2" (100 to pkg.)	.0058	Each		
			Pkg.	Bushings—Conduit—Galv.—3/4" (100 to pkg.)	.0079	Each		
			Pkg.	Bushings—Conduit—Galv.—1" (100 to pkg.)	.0195	Each		
			Only	Buttons—Push—All Metal	.19	Each		
			Only	Caps—Attachment—Composition	.05	Each		
			Only	Caps—Attachment—Soft Rubber	.10	Each		
			Only	Cells—Dry No. 6	.30	Each		
			Bot.	Cement—Flexall or equal—1 oz.	.17	Each		
			Pair	Cleats—Unglazed Porcelain—3-wire	.01	Each		
			Roll	Cloth—Aloxite—1 1/2"—No. 1 (50 yds.)	.0154	Foot		
			Quire	Cloth—Emery—9x11—No. 1/2	.05	Sheet		
			Lgth.	Conduit—Galv.—1/2"—(10 ft. lengths)	.059	Foot		
			Lgth.	Conduit—Galv.—3/4"—(10 ft. lengths)	.075	Foot		
			Lgth.	Conduit—Galv.—1"—(10 ft. lengths)	.108	Foot		
			Only	Connectors—Tinned—Stranded Wire—3 & 5 No. 6	.10	Each		
			Only	Connectors—Tinned—Stranded Wire—3 & 5 No. 8	.09	Each		
			Shts.	Copper—Cornice—Cold Rolled—32 oz.—18 ga.—30x96	.0027	Sq. In.		

Please furnish the above supplies

Approved by _____ Signature of Principal _____

Signature of Supervisor _____ Signature of Teacher _____

Fig. 1. School requisition with price list

Student's Name Olmsted, Earl Seat No. 11 Period 3 4 7

Job or Project Ultra-Violet Ray lamp Shop Room No. 182

Student's Electric Shop Requisition

Herbert Hoover High School

Your Next Period Class English 300 Room No. 134 Teacher Bankard

Course No. 100 Instructor Byron M. Taylor

Date Begun September 17-31 Date Finished November 17-31 Hours Spent 30

Retail Sale Value $10.00 Your Labor Worth per hour $.030

AMOUNT	NAME AND DESCRIPTION	COST PER UNIT	TOTAL COST	CLERK'S SIGNATURE	INSTRUCTOR'S CHECK	DATE
1 piece	Shingle tin 15"x19½"	0.15	0.04	Spear		10/8/31
1 "	" " "	0.10	0.03	Spear		"
1 "	Transite board 6"x12"	0.17	0.04	Spear		10/9/31
2 "	Hacksaw blades 12"x½"	0.07	0.01	Clerk		10/12/31
6	Machine screws 8-32	0.02	0.01	Clerk		10/12/31
4 "	Mica (heat proof) 11"x22"	0.47	0.09	Clerk		"
1 "	Hacksaw "H" -15"	1.90	0.01	Sheldon		10/13/31
1 "	Heater cord (6) Type K 75	2.10	0.10	Sheldon		"
1 "	Separable plug (2-piece)	0.05	0.01	Sheldon		10/15/31
1 "	Transite board 12x10"	0.17	0.01	Delgado		"
1 "	Shingle tin 7x8"	0.15	0.01	Delgado		11/5/31
2	"C" carbons	0.16	0.02	Delgado		"
	Grand Total		$.90			

Student's Signature Earl Olmsted Received Payment 12/1/31

TO STUDENTS: Make out both original (white) and duplicate (yellow) copies in full for each job or project, whether for yourself or for school, before asking for material. Present original copy to instructor for his "check" before presenting both copies to stock room clerk. Keep original copy in note book or job or activity sheet; present duplicate to stock room clerk who will issue material to you. Payments must be made not later than second week before the close of the semester.

TO STOCKROOM CLERK: Do not give out any material unless it is requisitioned, and then not unless instructor's "check" is in proper column on original copy. See that costs are accurately computed on each card. Keep duplicate copy of requisition filed alphabetically. Be sure to write your name in "Clerk's Signature" column for each article.

ORIGINAL (By Byron M. Taylor—All rights reserved—1931)

Fig. 2. The student's requisition

In the student's requisition, the student's name and job or project are placed at the extreme top of the card as an aid in filing in the stockroom. His next period class also is registered to facilitate matters if any of his tools or materials are found missing. If necessary, he is called out of his next period class and brought back to the shop. Because there is a constant rotation of clerks, it is necessary that each clerk sign and date the issuance of each article. These signatures as well as the student's signature make the transaction seem important and businesslike in the eyes of the students.

By recording the number of hours spent, and getting an approximate retail value of his project, the student can compare his work as to speed and value with others.

Other advantages of the student's requisition are: (1) it enables the instructor to enforce habits of neatness and orderliness; (2) it teaches related mathematics, spelling, and English; (3) with the aid of the standard price list or supply display board, it teaches materials and their prices, and (4) because his signature is necessary before a student can get any supplies, the instructor has full control of and a check upon the supply system at all times. Although this system may sound complicated, the author has found that when the student once realizes what is necessary before he can secure supplies, he soon learns how to prepare his requisition before presenting it to the instructor, and thus very little correcting has to be done.

Charging for Materials

Whether the school is to furnish the materials free to students or whether they are to pay for what they use, is a

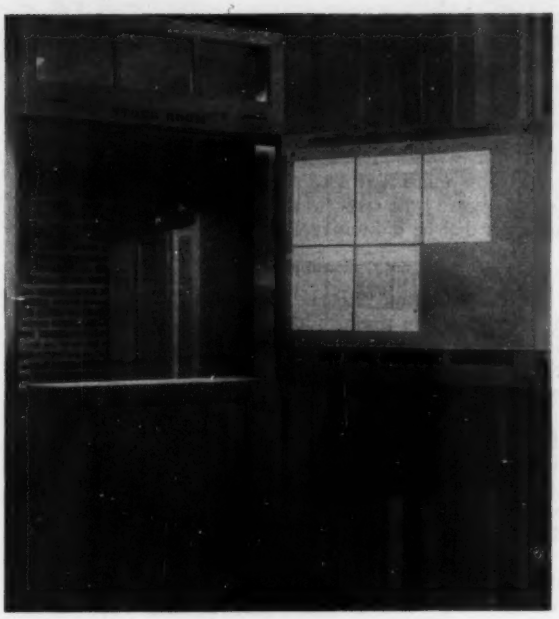


Fig. 3. The standard price list is posted near or on the stockroom door

question which has long confronted shop teachers. It is doubly troublesome in these times of high costs. Practically all of the arguments against charging for materials resolve themselves into the one that it discriminates against the student who comes from the poor family, and consequently:

1. It keeps down enrollment in shop courses.
2. Good students are forced to work on small, cheap projects and cannot choose projects commensurate with their ability.
3. It is undemocratic because there is no equality of opportunity. Rich and poor should be treated alike.

Arguments in favor of charging for materials are:

1. It discourages the avaricious who, if unchecked, would raid the stockroom.
2. It is a systematic and an orderly procedure and conforms closely to conditions in actual life.
3. It combats a growing attitude among our youth that they can "get by without paying."
4. Whatever the student makes for himself, belongs to him and is worth more than the price of the materials.
5. Students are deterred from attempting projects which are beyond their ability and require unnecessarily expensive materials.
6. Individual responsibility and habits of thrift and conservation are developed.
7. The per capita cost to the school will be diminished and fewer objections from the taxpayers will be raised. In view of present economic conditions, the shop departments should voluntarily reduce expenses before the public, never accurately informed, steps in and makes sweeping and devastating reductions.

The prevailing sentiment seems to be in favor of charging for materials, but the arguments given against charging are perfectly valid and cannot be completely ignored. The solution might best rest in a compromise — charge each student for the materials but do not expect complete reimbursement for the school. The rate charged must be such that the advantages of economy will be realized without imposing great hardships upon any student. Actual wholesale or cash outlay prices have been found satisfactory. In fact, the author has found that if even the poorest students sacrificed a few "movies" during the semester, they had no difficulty in paying their shop bills.

Standard Price Lists

Price lists must be prepared for each department in the entire system, so that the amounts charged are uniform throughout. Not only must standardized lists be written but the director of the department must insist that they be followed closely or else trouble will arise both for the director and for the instructor.

The author has originated a scheme which has been tried for a semester with more than ordinary success. Using the standard shop requisitions shown in Figure 1, the central purchasing agent types in the standard price to be charged the students. The units, in this instance, are those in which the materials are *sold to the pupils* and not those in which materials are *bought in quantity* for storage in the central warehouse. In many cases the two units will differ.

Copies of the price list are then sent to each shop in the school system. The standard requisition then becomes the standard price list for all students in that particular kind of shop in every school. These copies are posted near the stockroom door, as shown in Figure 3. A copy also is kept in the stockroom for the use of the clerk and another copy is retained by the instructor. On the bulletin board, besides this price list, may also appear a sheet of special materials with their prices and a sample Student's Shop Requisition filled out to assist the student in correctly making out his own.

New price lists, conforming to market fluctuations, should be sent out by the purchasing agent at least once each year.

Students, when making out their requisitions for each job or project, also compute the cost of each item and the total cost of each job. This causes them to use and remember the correct term and the cost of each item. Each item is checked by the stockroom clerk for cost and for amount. He then puts the duplicate copy of the requisition on file in the stockroom. At payment time, the instructor receives the money, marks both the student's copy and the stockroom copy "paid," the original copy going back to the student.

This system is simple and inexpensive because it requires the printing of no extra forms, merely modifying the use of

Fig. 4. Sample board

the standard shop requisition. It embodies all the advantages claimed for charging students for materials and in particular it effectively stops the "leaks" from and the "raids" on the stockroom. The latter alone makes it eminently worth while.

Supply Display Board

A continuation of the system just outlined is that of having a supply display board. While it requires considerable labor to prepare such a display board, yet the advantages accruing therefrom make it very much worth while.

Figure 4 shows how it is made. In an out-of-the-way part of the main room, a portion of the wall, about 4 ft. wide and 6 ft. high, is painted, preferably white. Or, if preferred, a separate board may be made up and fastened to the wall. The standard price list, which in itself is a modified standard requisition, is used as a guide, and a sample of each item listed thereon is fastened to the board. The samples are arranged on the board in the order in which they appear on the price list. Samples of items on the special supply sheet may also be placed on the board. The names of the items are then cut from the price list and each is pasted on or near the sample of the material mounted on the board. Thus the student not only sees and may handle the articles he wants and uses, but he also sees the correct terms in printed form and reads the correct prices. In this way, the actual material, name, and price becomes closely associated in his mind. Stockroom clerks are instructed to ignore all requests for materials that are not couched in the proper terms. In this way, the student is forced to look up the proper name, if he does not remember it. He thus becomes a much more intelligent reader of technical and related data. In this way the display board becomes a splendid teaching aid.

Inventory

Those who approve of the multiple uses of the standard requisition, as described in this chapter, will surely not object to the further use of it as a record or inventory. That is why the "quantity on hand" column was added to the original requisition sheet. If a fuller record is desired, a strip on which is the columns "date received," "costs," "purchased from," "address," etc., may be pasted to the original sheet.

Obviously, it is profitable to keep a record because the instructor may order more accurately for the coming year if he knows how much was used in the past. Equally important such a record will show whether he is being charged with materials that he did not receive.

Handling Money

In the section on "student's requisition" the method used by the student in paying for his materials has already been outlined. He merely presents both the original and duplicate copies of his requisition or requisitions, with the proper amount of money, to the instructor who marks both copies "paid" and returns the original to the student. The "dead line" for payment is set at the second week before the close of the term. Without a great deal of extra burden, the instructor can handle the money which he will receive in that way if he keeps a cashbook and enters all receipts and all disbursements.

Most instructors, however, will welcome the handling of the money by someone outside the shop, say, the financial secretary of the school. In this case, the student pays his bill at the office, where his requisition is stamped "paid" with the amount. He then shows this to the instructor who marks the duplicate copy "paid."

Of course, no student is allowed to take any job or project from the shop until he has paid for the material he used in making it. Occasionally, it may be necessary to exert even greater "pressure." This may be done by notifying the central office, the student's adviser, or the homeroom teacher to withhold the pupil's semester grades, for all subjects, until a clearance slip from his instructor has been obtained.

Outline of Printing Course

Leo E. Schmitz

South Intermediate School,
Saginaw, Michigan

The printing course described in this article covers three semesters of junior-high-school prevocational printing. The method of teaching the course and of checking the student's progress also are described.

The educational values of printing in the public schools are: first, printing is a medium of knowledge; and second, printing is intimately related to other school subjects, such as mathematics, art, English, history, science, and the like.

Printing arouses interest and develops self-reliance and constructive imagination, neatness, precision, and observation. It does not deal with theories, but offers concrete problems which the student can visualize.

The outline and information here presented, covers printing taught to junior-high-school students in prevocational classes. Its objectives are twofold: First, tryout — to give the student a practical insight into the elements of the industry, and acquaintance with the content and processes of the trade, and a knowledge of the materials and tools that are employed; second, to give the student the benefit of the educational value of printing.

The outline as presented herewith was compiled by Leo E. Schmitz, John C. Distler, Louis T. Soblesky, and E. V. Ahonen, all teachers of junior-high-school printing in Saginaw, and by Clyde E. Willard of the Arthur Hill Trade School.

Outlined Course of Study in Elementary Printing

FOREWORD

This course outline is for three semester's work, divided into Printing I, II, and III, for the respective semesters. The amount of work to be completed is based on what an average student should do in the time allotment of four hours per week for twenty weeks.

In the junior high school, Printing I is usually given in the seventh grade, Printing II in the eighth grade and Printing III in the ninth grade. Regardless of the grade in which a student begins printing he will take the course as outlined for Printing I. To meet the needs of above-average students the instructor will merely give more exercises or work in the specific operations.

Final tests are included to determine whether a student has completely covered and learned the contents of each course before entering the next.

PRINTING I

WHAT THE STUDENT SHOULD KNOW	WHAT THE STUDENT SHOULD DO
1. Layout of the type case.	
a) Why letters are not arranged alphabetically.	
2. Parts of a type — nomenclature.	Set straight-matter composition from reprint copy in the various indentions. Set poetry from reprint copy.
a) Type high.	
b) Ingredients of type metal.	
c) Type sizes.	
d) Machine cast type.	

3. How to read type.
4. Printers' system of measure.
   a) Table of units compared to the linear system.
   b) Comparison of various sizes of type bodies and composing materials.
   c) Reasons for standardization.
5. Spacing materials.
   a) Spaces and quads.
      (1) Comparative thickness of all.
      (2) Uses of each.
   b) Leads — slugs.
      (1) Thickness — length.
6. Tools and equipment.
   a) Composing sticks.
      (1) Setting of.
   b) Galleys.
   c) Composing rules.
   d) Proof presses.
      (1) How to operate.
   e) Roller brayer.
      (1) How used.
      (2) How cleaned.
   f) Type brush.
      (1) Why used.
7. Composition and copy.
   a) Composition.
      (1) Definitions.
      (2) Kinds.
   b) Copy.
      (1) Kinds.
8. How to set type.
   a) Holding the stick.
   b) Picking up type.
   c) Placing type in stick.
   d) Spacing and justifying lines.
      (1) Space out.
      (2) Space in.
      (3) Hyphenate and space out or space in.
         (a) Where to divide words.
      (4) Quad out line in a paragraph.
      (5) How to center a line.
   e) How to indent poetry.
   f) How to set the various indentions.
      (1) Regular.
      (2) Hanging.
      (3) Square.
      (4) Diagonal.
      (5) Half-diamond.

WHAT THE STUDENT SHOULD KNOW	WHAT THE STUDENT SHOULD DO
9. Handling type. *a*) How to remove type from stick. (1) Position of stick and galley on cabinet. (2) Position of fingers on type. (3) Method of rolling type out of stick. *b*) How to place type on galley. (1) Position of type in galley.	Transfer lines of type from stick to galley.
10. How to tie up type matter. *a*) Position of galley and of type in galley. *b*) How to hold string when starting. *c*) How to tie printer's knot.	Tie lines of type matter with cord.
11. How to pull proof on a proof press. *a*) How to ink type matter. *b*) Position of galley in proof press. *c*) Place paper on inked type matter. *d*) Operating proof press to run tympan roller over type. *e*) Remove paper from type.	Take proofs on a galley proof press.
12. How to clean type. *a*) Why clean type. *b*) Cleaning solution. *c*) Why and when use rag and brush.	Properly clean ink off type matter.
13. How to distribute type. *a*) From composing stick. (1) Holding stick. (2) Picking off words. *b*) From galley. (1) Type in correct position in galley. (2) Galley in correct position. *c*) How untie type matter — how wind string up. *d*) How to pick up type and place in left hand. *e*) How to pick off words. *f*) How to place letters and spaces into their proper boxes.	Distribute straight-matter composition.

PRINTING II

WHAT THE STUDENT SHOULD KNOW (Printing I Prerequisite)	WHAT THE STUDENT SHOULD DO
1. The various indentions for straight matter. The indentions used for poetry. How to properly space and justify lines.	Set straight matter in the various indentions from manuscript copy. Set poetry from manuscript copy.
2. Importance of proofreading. Proofreaders' marks. Application of proofreaders' marks. *a*) How to read and mark proofs. (1) How to hold copy. Must know what a revised proof is.	Read proofs with copyholder, marking errors with standard proofreaders' marks.
3. How to correct mistakes in the type matter from marked proof. *a*) Interpretation of proof marks. *b*) When to make galley corrections. (1) What mistakes can be corrected in galley. (2) How to lift letters out of a line of type. *c*) When to make correction by placing line in composing stick. (1) What mistakes to correct in this manner. (2) Position of galley and type matter in galley. (3) How to open up lines of type matter to remove and return lines.	Correct type matter from marked proof. *a*) Galley correction. *b*) Place line in stick for corrections.

PRINTING III

WHAT THE STUDENT SHOULD KNOW (Printing I and II Prerequisite)	WHAT THE STUDENT SHOULD DO
1. What an imposing stone is and how it is constructed and what it is used for. *a*) Purpose of the lip. What a letter board is. For what used. *a*) Purpose of the lip. When and how to slide the type matter off the galley and when to hold the type and pull the galley. How to hold galley against lip of stone or letter board.	Transfer type matter from galley to stone, from galley to letter board, and vice versa.
2. How and when to moisten the paper and how to place proof paper on a large mass of type matter or form after it is inked in readiness to take a proof with the planer. What a proof planer is and why it is felt covered. How to place proof planer on matter to be proofed. *a*) How to move planer about on form. *b*) How to lift planer off after proof is taken. How to strike the proof planer.	Take proof, using planer-proof method.
3. Must know the style of copy marking used in the shop in which the student is working. *a*) The marks used.	Read and interpret copy marks.
4. Must know the location of the type cases holding the display type as marked on the copy.	Set simple display matter from instructor's layout.
5. When and why to oil the platen press. *a*) Where to oil. *b*) Kind of oil. *c*) How much oil to use. *d*) How to wipe off the holes after oiling. *e*) The danger incurred to oil press when it is in motion.	Oil and wipe press under supervision.
6. Must know that press should not be in motion when cleaning it. Cleaning solution used — how much, and the kind of rags used.	Clean press — disk, rollers under supervision.

Must know what the disk is and what the rollers are — composition of rollers.
How to clean ink off disk and rollers.
a) How to run rollers on and off the disk.
b) How to remove rollers to wash up for colored ink.

7. Where to apply ink to the press. — Ink press under supervision.
   a) Why apply it at this point.
   b) How much to apply.
   How to start, regulate the speed, and stop the press.
   What tool to use when applying ink.
8. Equipment needed for locking up a form. — Lock small forms for platen press.
   a) Chase — kinds, sizes. — *a*) Chaser method.
   b) Quoins — advantages and disadvantages of different kinds.
   c) Quoin keys.
   d) Wood furniture—sizes, care, and use.
   e) Metal furniture—sizes, care, and use.
   f) Reglets—sizes, care, and use.
   g) Type planer.
   h) Bearers—use of.
   Must know that two methods, chaser and furniture within furniture, are used in locking forms.
   Must know the steps and procedure to lock a form using the chaser method.
   a) Position of form in the chase — reasons for it.
   b) Arrangement of wood furniture around the form.
   c) Arrangement of wood furniture to fill the chase.
   d) Where and how to place quoins.
   e) Where and why to place reglets.
   f) How and when to plane form.
   g) How to tighten quoins.
   h) How to test form for lift.
   i) How to remedy loose lines, etc.
9. Must know what the bed of the platen press is and how a chase is fastened and held in the bed. — Place small forms in bed of platen press under supervision.
   a) Position of quoins when form is in place.
   How to lift and hold chase and form to carry to the press.
   a) Position of quoins when form is picked up.
   Position of rollers on press.
   How to set form into bed and fasten it.
10. How to lift form from bed of press. — Remove the form from platen press and properly clean it.
    Must know that the form, chase, furniture and all must be thoroughly cleaned before it is unlocked, etc.
    a) Form must be brushed well.
11. Must know the following parts of the press. — Feed simple job made ready by instructor.
    a) Feed board.
    b) Delivery board.
    c) Platen.
    (1) Tympan.
    (2) Draw sheet.
    d) Throw-off lever, use of.
    e) Fly wheel.
    f) Grippers, use of.
    g) Gauge pins.
    h) Counting machine, how to set it.
    How to fan out a pile of sheets as an aid to grasping the sheet.
    How to grasp and hold a sheet to feed it.
    How to strike gauge pins to slide sheet into position.
    How to remove sheet after impression.
    a) Use of sand paper.
    b) How to jog sheets against pin on the delivery board.
    Must know how to clean an impression off the tympan.
    a) Why clean it off.
    Must know all safety precautions.
12. How to unlock a type form. — Unlock forms and put away all lock-up material.
    a) Position of chase on stone.
    b) How to loosen quoins — why.
    c) How to remove furniture and lock up material and where to put it — its proper place.
13. How to start, wind and finish off the tie when tying up dead matter on the stone. — Tie the dead matter on the stone.
14. Must know how to fan a pile of sheets to allow air to pass between the sheets for jogging. — Gather, jog, fold, punch, perforate, stitch, and pad simple bindery jobs under supervision, using hand- and foot-power machinery only.
    How to fold sheets of paper square.
    How to place sheets into a punch.
    How to operate punch either foot or lever.
    How to place sheets into a perforator.
    How to operate the perforator.
    How to place sheets on the saddle or table of the stapler.
    How to step on the pedal of the stapler.
    How to apply pad cement or glue.
    a) How much to apply.

PRINTING I

Individual Record Card

Name_____ Gr., H. R._____ Sem.____ Yr.____ Hr.____

TO DO Operations		Ex.	Ex.	TO KNOW Sets of Questions	Gr.
1. Set straight matter from reprint copy in the indentions listed below.				1. Layout of the case	
Set poetry from reprint copy				2. Parts of a type	
Regular				3. Printer's System of Measure	
Hanging				4. Spacing Materials	
Square				5. Tools and Equipment	
Diagonal				6. Composition and Copy	
Half-diamond				7. How to Set Type	
2. Transfer lines of type from stick to galley				8. Handling Type	
3. Tie lines of type matter with cord string				9. How to tie-up Type Matter	
4. Pull proofs on galley proof press				10. How to Pull Proofs on Galley Proof Press	
5. Properly clean ink off type matter				11. How to Clean Type	
6. Distribute straight matter composition				12. How to Distribute Type	
a. From stick				Grade on first marking period	Final Grade
b. From galley				Grade on 2nd marking period	
				Grade on 3rd marking period	
				Final Examination Grade	

PRINTING II

Individual Record Card

Name_____ Gr., H. R._____ Sem.____ Yr.____ Hr.____

TO DO Operations		Ex.	Ex.	TO KNOW Sets of Questions	Gr.
1. Set straight matter from manuscript copy in the indentions listed below.				1. Indentions— Spacing and Justifying Lines	
Set poetry from manuscript copy				2. Importance of Proof Reading	
Regular				3. Correcting Mistakes in Type Matter	
Hanging					
Square					
Diagonal					
Half-diamond					
2. Read proofs with copyholder, marking errors with standard proofreaders' marks					
3. Correct type matter from marked proof				Grade on first marking period	Final Grade
a. Galley corrections				Grade on 2nd marking period	
b. Place line in stick for corrections				Grade on 3rd marking period	
				Final Examination Grade	

PRINTING III

Individual Record Card

Name_____ Gr., H. R._____ Sem.____ Yr.____ Hr.____

TO DO Operations		Ex.	TO KNOW Sets of Questions	Gr.
1. Transfer lines of type matter from galley to stone, from galley to letter board, etc. or vice-versa			1. Imposing Stones— Letter boards	
2. Planer Proof			2. How to Pull Proofs with Proof Planer	
3. Read and interpret copy marks			3. Copy Marking— Display Type Cases	
4. Set simple display from layout			4. The Platen Press	
5. Oil and wipe press			5. Locking and Unlocking Forms	
6. Clean press, disk, rollers, etc.			6. The Bindery	
7. Ink press			7. History of Printing	
8. Lock small forms			8. Paper	
9. Place small forms in bed of platen press			9. Ink	
10. Remove form from press and properly clean it				
11. Feed press				
12. Unlock form and put away all materials			Grade on first marking period	Final Grade
13. Tie dead type matter on stone			Grade on 2nd marking period	
14. Bindery work:			Grade on 3rd marking period	
a. Gather b. Jog c. Fold			Final Examination Grade	
d. Punch e. Perforate f. Pad				
g. Stitch				

Individual record cards

RELATED WORK

1. Brief history of printing from the earliest times.
2. Must know briefly about paper manufacture.
3. Must know briefly about ink manufacture.
4. Must know something of the health requirements, sanitary precautions, and safety precautions in the printshop.

ADDITIONAL FOR EXCEPTIONAL STUDENTS IN PRINTING III

(Printing I, II, III, Prerequisite)

1. Must know what the bales are and how to open and close them. How to make the draw sheet and tympan sheet tight and free from wrinkles, etc.	Change draw and tympan sheets on platen press under supervision.
2. How to mark out for placing guides. *a*) Margins. How to insert guides in tympan sheet so as to make them secure. *a*) When to seal. *b*) Watch tongues.	Place guides on platen press, for simple job, under supervision.
3. Must know type sizes. Must be able to compare nicks and faces of type and know why they are compared. Must know the location of the different cases, and sizes of type.	Distribute display composition under strict supervision.

Method of Teaching

The method of teaching the contents of the outline is as follows:

Printed instruction sheets covering the processes listed in the column, *What the Student Should Do*, and information sheets for the items under the column, *What the Student Should Know*, were prepared. A series of exercises in straight-matter composition arranged according to progressive difficulties also were outlined. The exercise sheets contain the copy and specifications. All of the sheets are 7 by 10 in., printed on bristol and book paper. Those on the book paper are punched and fastened together with ring binders; those on bristol are kept in a filing cabinet.

For each of the units under Printing I, II, and III, printed sets of questions covering the main topics in the column, *What the Student Should Know*, are provided. These questions are given to the student as part of his written work and are not considered tests. They are merely used to supervise his study. Reference books are used to find the answers, and to secure more information than that given on the instruction sheets and in the lectures.

Checking Student Progress

The outline of instruction, arranged on a large chart, is displayed on the wall of the printshop so that each student can check his own progress. This enables him to know at all times what and how much work he has covered and how much is still left for him to finish.

When a student enrolls for *Printing I* he is given a notebook, in which to keep the proofs of his work, etc. In this notebook is fastened the student's individual record card, a sample of which is shown. He checks the items on the card as he completes them. The notebook used should be large enough to be adequate for Printing I, II, and III. It stays in the teacher's possession until the student finishes the 9A grade and leaves the school. This is done so that if the student comes back, after finishing Printing I or II, to take more work in printing, the instructor has an absolute check on the amount of work that already has been completed. This enables him to start the student without any further reference to other records. Likewise, if the student transfers to another printshop in any school in the city, the printing instructor at that school is given the notebook and has the same check on the pupil's progress that the former instructor had.

At the end of each unit, a final test is given to determine whether the student has completely and satisfactorily covered the content of that unit.

Keeping Up the School Printshop

Herbert Warfel

Joliet Township High School,
Joliet, Illinois

Assigning the responsibility of returning everything to its proper place at the end of each class period to specified individuals, frees the teacher for the more important duty of actual teaching.

Unlike a commercial printshop, the school printshop workers are practically all beginners. Very likely all of them are novices, ignorant not only of the uses of the tools and materials but even of the places in which they are to be kept.

If the teacher is going to attempt personally to put away everything that has been left lying around or even everything that has been carefully put in the wrong place, he has his life's work cut out for him. If, on the other hand, the instructor intends to conserve a little of his time for the instruction of his students, he will do well at the very beginning of each term or semester to assign the housekeeping duties to his students, dividing the work among as many of them as possible, and giving each a small but definite assignment.

With one student assigned to keep the furniture in place, and another to inspect the lead rack (or if that is too big a job, some subdivision of the lead rack), just that much of the burden will be removed from the teacher's shoulders. The teacher, of course, will occasionally have to check up on the work, but after the students understand definitely what they are supposed to do, the process will be almost automatic and will take a minimum amount of time from the class period.

The practice of having students assigned to certain definite parts of this task may at first seem to offer a temptation to the other students to be careless with the materials which they use and for which they are responsible. It often happens, however, that the student is in a better position to check up on such carelessness than the teacher, and so to make it more difficult for such neglect to go undetected. The larger the class, the more of these duties there are to be done, because the amount of materials and the tools will necessarily increase in proportion to the size of the class; but the number of students available for the work also increases with the size of the class, and so the problem solves itself.

The students should not be kept too long at the same clean-up tasks, and a sliding schedule should be made so that after a time one student takes up the duties of the other.

Some of the chores that can be thus assigned to students are: Sorting pi (several students should be assigned to this job so that it will not become a burden on anyone), oiling and wiping the machines, straightening the lead rack, checking up on the positions of the cases, inspection of the banks and alleys to see that type is not being wasted, taking care of the composing sticks, and keeping order in the stockroom.

If these duties are regularly attended to by students with occasional supervision by the teacher at the beginning of the class period, the time necessary for this work will be much reduced and the teacher will have more opportunity to devote the greater part of each class period to teaching.

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

J. J. Metz, Editor

Industrial Arts and Specialization

A subscriber asks "Why industrial arts in an age of automatic machinery and extreme specialization?"

Probably it might be best to determine briefly what automatic machinery and specialization have done for us before we try to see where an industrial-arts course fits into the educational scheme of a machine era. In no country has automatic machinery and specialization been carried as far as in America. Because of this fact the average American can enjoy many things which are possible only to the wealthier inhabitants of other countries. Were it not for automatic machinery and specialization, the number of people in our country who now own and enjoy automobiles, would be very much reduced. Numerous household appliances, such as vacuum sweepers, electric washers, electric dough mixers, electric clocks, electric cigar lighters, curling irons, and flatirons, would be available only to those in better circumstances. Nor could thousands of home crafters equip their shops with the small power machines that are now generally available.

As it is, automatic machinery and specialization have made it possible for the average American so to equip his house with electrical appliances that the drudgery of household work has been much reduced. To use properly and care for these many time and labor savers, however, an intelligent understanding of the principles which underlie their operation is a real necessity. If industrial-arts work did nothing more than provide our future citizens with this understanding of how they can get the greatest use out of the offerings which the ingenuity of genius has placed at their disposal, the school would have ample justification for introducing industrial-arts courses into every junior and senior high school in the country.

The very question "Why industrial arts in an age of automatic machinery and extreme specialization?" would indicate that the questioner has overlooked the fact that industrial-arts work in the school shop is not meant to provide specific training in a narrowly limited vocational sense. In viewing industrial-arts work as a whole, it must ever be remembered that this work has for its purpose to give general knowledge of industrial processes, relationships, and materials; to provide opportunities for exploratory purposes; to develop appreciation for materials, and for the work of others; to develop interests, attitudes, self-reliance; the ability to do general repairwork about the home; to foster an understanding of the scientific principles underlying the operation of the many mechanical and electrical contrivances with which we are surrounded; and to assist the consumer in making the proper selection out of the large variety of things offered for his use.

Because automatic machinery and specialization have increased the variety and number of useful home, office, and shop appliances, the necessity of being able to make the proper choices, to understand the operations of these devices, to have an intelligent appreciation of the scientific principles underlying their operation, makes industrial arts in the present and coming era of even greater importance than it has been in the past. Then, too, the fear so often expressed during the present economic depression that the machine will produce an ever-increasing number of unemployed, places the very important problem before the schools, how to provide training which will fit men properly to use their leisure. Probably no other course of study can solve this problem so well as the industrial-arts course. As a matter of fact, these prophets who seemingly deplore the fact that we have labor-saving machinery, need not fear the ultimate effect of its use in this or any other country. It is true that the worker's leisure will no doubt be increased, but we need not fear that man who is clever enough to invent machines which fashion with uncanny skill many of the things that the human family needs and can utilize, will be unable also to devise ways and means whereby the products of these machines may be used without harming that large part of the human family commonly known as the wage earners.

Admitting, then, that the human family will work its way through and out of the present situation, it is perfectly safe to predict that industrial arts, if the proper objectives are kept in mind, will be of increasing importance no matter how far automatic machinery and specialization is carried. The mistake must not be made that the school forget the general educational objectives which underlie industrial-arts work. It must more and more be looked upon as part of general education and the increased emphasis which frequently gives industrial-arts work a strictly vocational slant must be carefully avoided.

Are Conventions Worth While?

Recently the writer overheard a conversation between two teachers. The statements which one of them made are herewith reproduced, and while the quotations are not verbatim, nevertheless they contain the gist of what was said.

"I have attended many teacher conventions," said one of them, "but I fail to see where they do any great good. The programs contain little of importance, and less than one half of one per cent of those in attendance go back with any worth-while ideas that can be put to use in their schoolwork."

"Recently," the speaker went on, "I attended a convention in which not one word was said about the possibilities of closing some of the state's vocational schools, nor about the fact that many senior-high-school shop teachers have been dropped during the past year. There were no talks which showed what the shop teachers in some communities have done to strengthen their work in the mind of the public so that admin-

istrators could not drop shopwork without arousing public indignation."

These words contain an awful indictment if there is any truth in them, and no doubt they may contain some little grain of truth. However, it takes but a little retrospection to realize that the statements are very much overdrawn. Take the A.V.A. convention held at Kansas City, for instance. Both the vocational and the industrial-arts programs were very much to the point in showing what is expected of these types of educational efforts in the troublesome times which have submerged our country. There were real live discussions too, showing that administrators, supervisors, and teachers are keenly alive to the situation, and that, while the dismal shadow of departments to be closed, teachers to be discharged, and salaries to be reduced loomed threateningly in the background, nevertheless, strenuous efforts were being made to revise, reconstruct, and shape the work so that reduced budgets could be met without harming the effectiveness of the schools' offerings, and without going to the extreme of actually depriving the youth of our country of the type of educational work from which the majority will derive the greatest benefits.

A study of the Western Arts Association program to be held at Columbus, May 3, 4, 5, and 6, shows that the program makers of that organization also have earnestly tried to make the industrial-arts sessions not only interesting but helpful to all those who attend. There are definitely planned inspection trips through the research laboratories of industrial-arts work at the Ohio State University, discussions on the derivation of course content, on the organization of instructional material, on the method and validation of doing research work, on researches made in shop planning, on the derivation of industrial-arts objectives, on the integration of industrial-arts work with other courses, and a study of the history of industrial-arts work.

Any industrial-arts teacher who cannot find something in this program that will assist him in improving his work, is not susceptible to further professional betterment.

The state associations, too, have tried to arrange programs that would be worth while. Anyone who has attended any of the conventions held by the Illinois Vocational Association, by the Michigan Industrial Education Society, by the Indiana Industrial Education Association, or by other similar organizations, would not subscribe at all to the opinions expressed by the speaker. The writer has attended Saturday afternoon sessions at some of these conventions, where upward of 150 earnest shop teachers attended a sectional meeting and remained until four o'clock. This was done in spite of the fact that a good football game between two prominent universities was being played within car-ride distance of the convention hall. No one would hesitate to say that those in attendance carried something back to their classrooms.

Then too, those who attend conventions in the proper manner know that the participation must be active rather than passive. If someone in attendance at a convention has a problem that he is vitally interested in solving, it is to be presupposed that he also possesses enough initiative and gumption to discuss it, either publicly or privately. That is what these gatherings are for. Even if the convention program were as poorly planned as the speaker tried to intimate, although evidence shows that he is in error, the really earnest teacher who attends with the will and determination to spend his time profitably while in attendance would return to his work with so much worth-while information gathered here and there from his confreres that he could amply justify the time spent at the convention.

The End of the Semester

It does not seem so long since school opened, and yet the students are well toward the end of the second semester. Probably some of those who have finished the last semester have passed through the school shop for the last time. They have received their high-school diploma, and are ready for entry into the world of industry, but industry is not ready to take them. What is the school doing to take care of this state of affairs?

True, school teachers have had to take cuts in salary, and administrative budgets have been slashed. How can added burdens be taken up? How can the graduates, even if they can be persuaded to come back, be accommodated? Yet, no school teacher or administrator will feel under present conditions that they are doing justice to themselves or to their graduates if they simply hand out diplomas and wish the departing students, good luck.

The welfare of our country demands that the young people who are now ready to leave school be guarded against developing habits of idleness and shiftlessness in this time of unemployment. To keep them from getting into wrong habits, they must be urged to keep themselves properly occupied until industry and business are again in a position to function normally.

Many of these young men and women can be persuaded to continue their education on a part-time or full-time basis, even though they may have little money to contribute for the instruction. The school must make this effort and this sacrifice since few other agencies are doing anything in a larger way to keep these young people from becoming delinquents before they have had an opportunity to acquire those habits of self-direction and self-control which a good American citizen should have.

Now is the time, therefore, to encourage them to attend institutions of higher learning, or to make provisions for those prevented by economic conditions from attending colleges and universities, by offering assistance to those taking trade work, or extension and correspondence courses. If this is done, this time of enforced unemployment, instead of being a curse, may become a blessing to those who are finishing their secondary education.

Ornamental Concrete Work

E. G. Livingston

Assistant Professor of Industrial Arts,
Iowa State College, Ames, Iowa

Interesting, economical, useful, are some of the qualities which may be claimed for the projects illustrated in this article. Besides this, these projects can be made to bring out worth-while teaching content.

The accompanying illustrations show only a few of the many artificial-marble projects that may be made. They will interest both pupils and instructor. They have an especial appeal to the teacher who is of a creative turn, for the possibilities of expression are practically unlimited.

The illustrations, however, do not portray the beauty of the articles. The effect produced by the intermingled browns, reds, greens, yellows, and blacks with the contrasting white background must be seen to be appreciated. The square tile is brown, green, black, and white. The small clock is chocolate and white.

The projects described herewith are especially adapted to the present time, where materials for use in industrial-arts classes must be relatively inexpensive. The small tiles shown can be made at a cost of less than two cents each. The forms may be made of scrap material and may be used again and again.

The material is easily manipulated, too, and it is inexpensive and obtainable everywhere. Besides this, the possibilities of originality of design are unlimited, and the product is useful and quite attractive. While the process is so simple that children in the upper grades can successfully handle it in forms furnished them, the building of the forms and casting the articles will challenge the skill of the high-school boy. The girls in arts and crafts courses also will enjoy producing these articles.

The materials required are (*a*) Keen's cement, (*b*) either dry cement colors or limeproof plaster colors, and (*c*) clean water. Keen's cement may be purchased in any amount at any building-supply firm.

The equipment consists of a mixing bowl of granite or crockery, a heavy, tinned or granite spoon for mixing, and coarse and fine carborundum stones for polishing. A measuring cup is useful but not essential. The initial polishing must be done in water, so, of course, a sink, a washbowl, or a large pan is also necessary.

The making of the flat, square tile is the simplest project both as to making the form and polishing the piece. Figure 1 shows how the form is made. When this is finished, the inside should be coated with something to prevent the wood from absorbing water. A good "dope" is made by melting paraffin and adding an equal quantity of coal oil. This "dope" should be used sparingly.

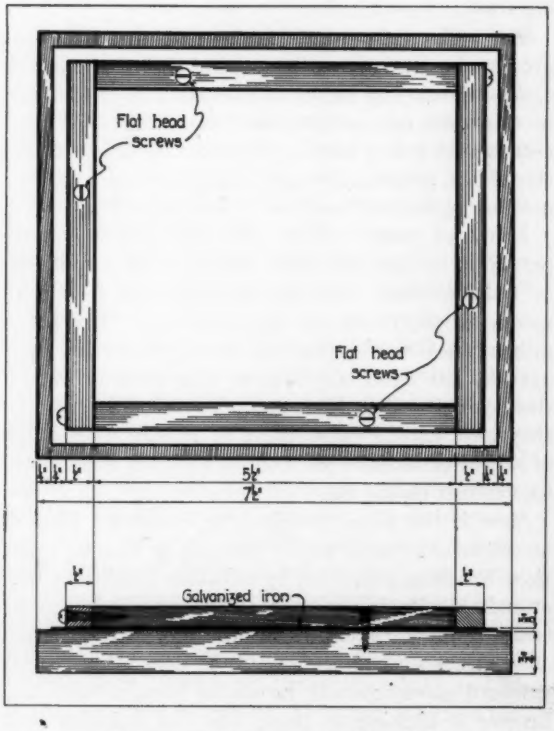
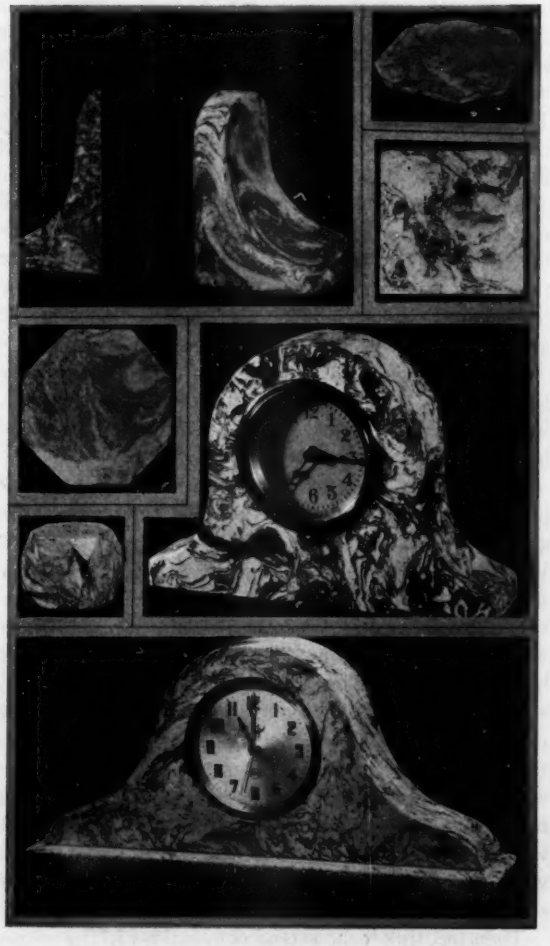


Fig. 1. Simple form for making tile



Various projects that have been cast

Preparing the Mix

The proper amount of cement to use to just fill the form will need to be ascertained by experiment. Here is where the measuring cup is handy. A ⅜ by 5½ by 5½-in. tile requires 1 cup of Keen's cement and a little more than ¼ cup of water. The mix should be rather quaky, but not sloppy. It should settle to a level surface with a little shaking of the mixing bowl but should not be watery.

After the cement and water are well mixed, the color, or colors, may be added. The amount of color to use must also be determined by experiment, but the best results are obtained by using the colors sparingly. To get the marbleized effect simply shake the color on top of the batch and cut it in with the spoon. Be sure that there are no lumps of dry color, but do not mix so much that you lose the effect of contrasting white. If you wish to use more than one color simply mix different colors in different parts of the batch. Many beautiful color combinations may be worked out.

There is no need to hurry, as Keen's cement may be safely used nearly two hours after it has been mixed with water. If for any reason the casting has to be delayed for an hour or even more, the batch may be retempered by adding water and remixing.

After the batch has been placed into the form, shake it down by banging the form down on top of the bench or table. Do not allow the material to spread over the edge of the form. It is better not to trowel the surface because that causes the colors to mingle in a muddy mixture. Place the form on a level place free from excessive dust, and allow the mixture to set for about 24 hours. The length of time for setting depends upon the drying conditions. The material should be allowed to dry sufficiently so that its surface will not wash away in the initial polishing.

The tile is removed by taking the form apart. It is then polished under water with a medium or coarse carborundum stone and then finished with a very fine stone. Wet-or-dry sandpaper also serves quite well if used on a large, hardwood block. Large air holes that may appear in the casting, may be filled with a mixture of Keen's cement and water, adding a little color if necessary. The polishing must be done under water to keep the stone or sandpaper clean and to prevent rubbing the colors into the white.

When the surface and the edges have been made smooth and level, the tile should be allowed to dry for several days more. A final polish is then given with a fine stone used dry. If desirable, the surface may be further finished with several coats of clear lacquer after which it is to be rubbed down. Furniture wax may be used also, but it has a tendency to discolor the white cement.

The forms for the clock case and the book ends are more difficult to make, but the ingenious industrial-arts teacher will have no trouble with them. It is good practice to give the inside of the larger forms several coats of lacquer to seal the wood. The core for the clock case should have plenty of draft and may be covered with metal. Do not use tin in the forms, as any bit of rust discolors the white cement. For the same reason, it is not wise to use tin or iron utensils or mixing tools. The surfaces that are not flat may be polished with fine wet-or-dry sandpaper, or fine emery cloth used dry.

Senior-High-School Electricity

I. G. Terry

Instructor in Shop Electricity, Senior High School, Marshalltown, Iowa

(Continued from March)

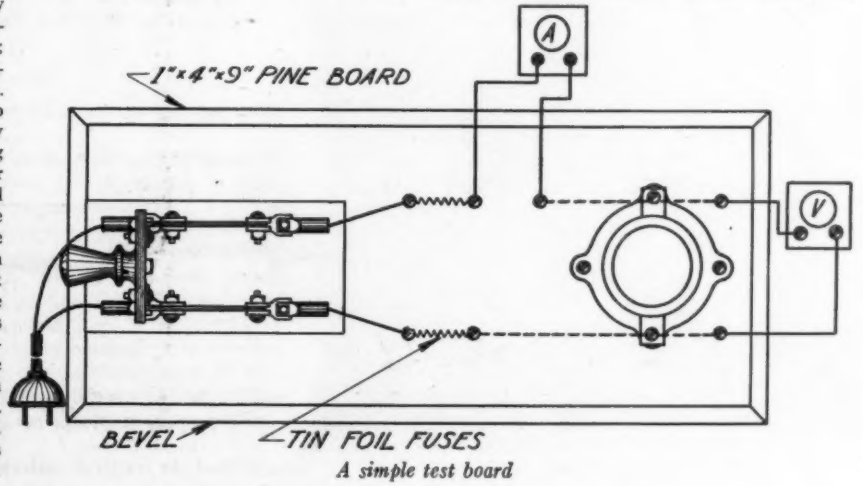
Typical Instruction Sheets — Practical Electricity

Instruction Sheet Number 10

Test Board and Ohm's Law

A. Construct a test board:

1. Materials: Double-pole single-throw knife switch; 7 binding posts; porcelain receptacle; 2 yds. drop cord; 2 ft. bell wire; one cap and plug body (compound); light bulb (10-watt); small piece tin foil; stain; four 1-in. screws; soft-pine board, 1 by 4 by 9 in.
2. Instructions: Dress board to dimensions and bevel. Apply stain. Drill holes for binding posts and make grooves for wires in bottom as indicated in the drawing. Mount the switch on one end of the board so that it will open toward the other end. Mount the socket on the opposite end. Insert the binding posts in the drilled holes, countersinking the heads so that the threads will extend through the board the proper distance. Wire the circuit as shown. Solder the wire to the heads of the binding posts. Insert extension cord through plug cap and tie underwriter's knot in end of cord. Strip insulation from ends of cord and attach to plug. Pull underwriter's knot well down into plug cap. Tie underwriter's knot in other end of cord, strip insulation from ends and attach to switch as shown in the drawing. Insert strips of tin foil between binding posts next to switch as shown in drawing. Insert bulb in socket.
3. Uses:
   a) Connect a one-ampere a.c. ammeter and a 100-volt voltmeter between the binding posts as shown.
   b) Take the readings of the meters and determine the wattage of the bulb. Watts equals voltage times amperes.
   c) By Ohm's law determine the resistance of the bulb.
   d) Remove the bulb and insert the plug body in its place. Plug in an electric soldering iron, flatiron, curling iron, or any other convenient electrical device and calculate the



A simple test board

resistance and power consumed in a similar way.

e) Remove the meters and insert the bulb again in the socket. Attach two lengths of extension cord to the terminals where the ammeter was connected. With the two free ends of the extension cords the board may now be used to test various electrical devices for short circuits.

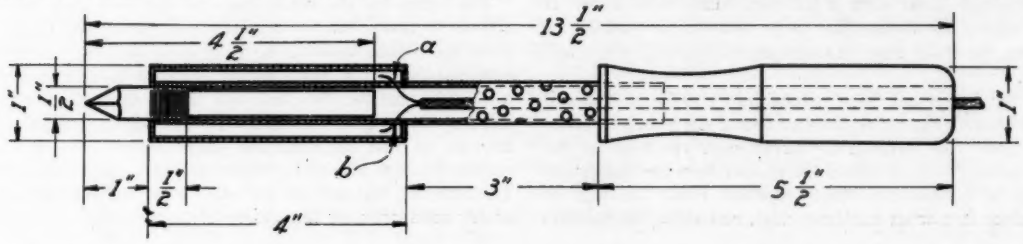
B. The test board may be kept in the tool box for ready use.

Instruction Sheet Number 11

Electric Soldering Iron: Heating Effect of Current

A. Construct an electric soldering iron:

1. Materials: Copper or brass rod, ½ in. in diam. and 4¾ in. long; brass tube, ½ in. in diam. by 8 in. long; 2 iron washers 1 in. in diam. and with ⅜-in. holes in center; piece of sheet tin or thin galvanized sheet iron, 3½ by 4½ in.; 15 ft. No. 34 nichrome wire; 2 sq. ft. asbestos paper; 2 oz. furnace cement; 6 ft. drop cord; attachment plug; 2 ft. friction tape; hardwood piece, 2 in. square and 6 in. long; 16 in. asbestos insulated, flexible wire.
2. Instructions: With file or grinder dress down one end of rod to a point as shown. Turn on metal lathe or dress down with a file 3¼ in. of the other end so that it will fit snugly into the brass tubing. Turn or dress down ½ in. more toward the point so that it may be threaded for the tubing



and thread this ½-in. portion as shown in the drawing. Thread the inside of one end of the brass tubing ½ in. back to fit the threads cut on the copper rod. Drill 2 holes 3/16 in. in diam. on opposite sides of the brass tube 3¾ in. from threaded end shown at *a* and *b* in the drawing. Drill ⅛-in. holes from here back to the unthreaded end for ventilation (number and space to suit, see drawing).

Cut a piece of asbestos 3 by 3½ in. and paste with thin coating of furnace cement on one side and paste it around the brass tube between the 3/16-in. holes and the threaded end. Insert two 8-in. lengths of asbestos insulated wire into the unthreaded end of the brass tube and draw the ends of each wire through one of the 3/16-in. holes on opposite sides of the brass tube.

Securely attach, by twisting together, one end of the No. 34 element wire to one of these lead wires and wind closely but do not allow one winding of the element to touch any other. After one layer has been wound on, insulate it with two layers of asbestos paper pasted on one side with furnace cement similar to the layer on the brass tube, and wind another layer of element over this insulation. If the job has been carefully done these two layers will take up all the 15 ft. of the element wire. Attach the free end of the element to the other lead wire. Thoroughly dry the element in a hot flame and test for shorts with your test board.

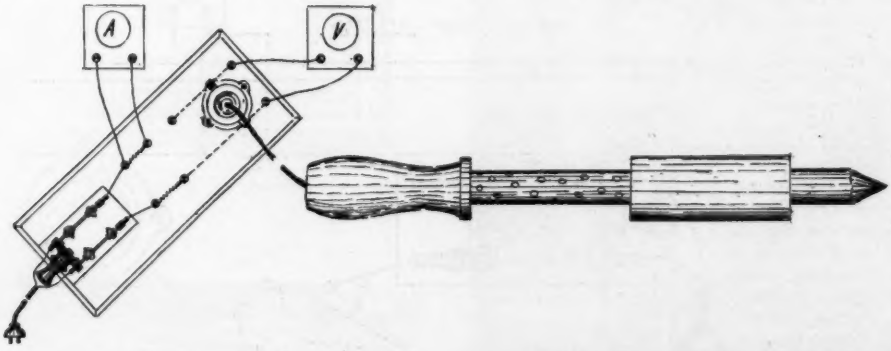
Ream out one of the iron washers so that it is just a little smaller than the brass tube. Heat the washer until it is red-hot, and while the brass rod is at room temperature drive the washer over it until the washer comes to the edge of the 3/16-in. holes. Ream the other washer until it fits snugly over the threads on the point of the iron and against the shoulder. Turn wood piece for handle to any desired pattern, drill hole through it from end to end and insert extension cord through handle and attach to leads through brass tube. Insert brass tube into handle. Insert point into other end of brass rod. Fill space between washers with furnace cement or asbestos paper and cut and seam the tin or galvanized sheet metal to fit over element for cover.

Instruction Sheet Number 12

Practical Problems Involving Use of Constructed Devices
Test Board and Soldering Iron

I. Find the resistance in ohms, the power consumed in watts, and the cost per kilowatt hour at local rate of electrical power for using the soldering iron.

II. Circuit: Connect in circuit, as shown by the diagram, the test board, an ammeter (3-ampere a.c. meter), a voltmeter (120-volt a.c.), and your soldering iron. Remove the light bulb from the socket of your test board and insert in its place a screw plug so that the attachment plug on the iron may be plugged into the socket.



III. Connect the attachment plug on the test board into 110-volt source, and read the ammeter and voltmeter. Call the amperes *I* and the voltage *E*.

IV. By Ohm's law find the resistance of the element of the soldering iron.

Formula for Ohm's law:

I equals *E* divided by *R*; *R* equals *E* divided by *I*; *E* equals *R* times *I*.

V. Find the watts of electrical power consumed by the iron.

Watts equals Volts times Amperes.
Formula: W equals E times I.

VI. Reduce watts to kilowatts.
Kilowatts equals Watts divided by 1000.
Formula: Kw equals W divided by 1000.

VII. Find cost per hour at current rate of using soldering iron. One kilowatt of electrical power used for one hour is called a kilowatt hour. Your house meter measures directly kilowatt hours.
Kilowatt hours times current rate equals cost.

Practical Electricity Test

Ohm's Law

1. State Ohm's law.
   I.
2. Write the formula in three different ways.
   I.
   II.
   III.
3. An electric soldering iron draws ¾ ampere of current on 110 volts.
   I. What is the resistance of the element? ———
   II. How many watts does it consume? ———
   III. At 10 cents per kilowatt hour what will it cost to use the iron for three hours? ———
4. Element wire for a flatiron has a resistance of 2 ohms per foot. The label on a flatiron shows that the iron takes 5 amperes of current on 110 volts. If you were buying a new element, how many feet would you purchase? ———
5. A curling iron uses 1/10 ampere of current on 110 volts. Find:
   I. Ohm's resistance in the element ———
   II. Watts of power it uses ———
   III. Cost per hour to operate it at 11 cents per kilowatt hour ———
6. An electric popcorn popper uses 5 amperes of current on 110 volts. Find:
   I. Cost of operating 8 hrs. at 8 cents per Kw. hour ———
   II. Horse power equivalent ———
   Note: One horse power equals 746 watts.
   III. Would it take as much electrical power as a ¼-h.p. washing-machine motor? ———

Problems and Projects

CROWFOOT STAND

W. A. DeVette, Wilson Junior High School, Erie, Pennsylvania

(See Supplement No. 265)

The stand described in this article is far removed from the conventional and is very pleasing in appearance, especially so when finished in the two-tone lacquer now in vogue. White pine or poplar may be used in the construction of this project.

Bill of Material

1 pc.	¾	x 10	x 15	Top
1 pc.	¾	x 12¼	x 27⅞	Leg
2 pc.	¾	x 3	x 8¼	Top Braces
2 pc.	½	x 2⅜	x 15	Leg Braces
2 pc.	¾	x 4	x 9⅝	Feet
1 pc.	⅜	x 1¾	x 13	Center Base Strip
2 pc.	⅜	x 1¾	x 10¼	Side Base Strips

6 Wood Screws, 1½-in. No. 10 f.h.b.
4 Wood Screws, 2½-in. No. 10 f.h.b.
2 Finishing Nails, about 3 in. long
Brads

Construction

Make full-sized patterns, preferably in the drawing room, of the top, top braces, and leg.

The leg is laid out according to the dimensions given in the drawing, and the braces by laying out the pattern in ½-in. squares, but the top may need some explanation.

The top being an ellipse may be laid out in any one of several geometric methods. In the one illustrated, a string is used in drawing the actual curve. On the paper draw the vertical and horizontal center lines. On the horizontal line step off the distances shown in the drawing and step off point D 5 in. above A-B on the vertical line. Drive brads or tacks at points A, B, and D and tie a string around the three points. Remove the brad at D, replace it with a pencil point and by holding the pencil firmly in the loop scribe the desired curve as indicated.

After cutting out the patterns build up the leg, glue the parts together and put away to set while making the other parts.

The same pattern which was used for the leg may now be used again for the two feet, using only as much as desired, 10¼ in. from the front edge.

Pieces to be made in duplicate should be fastened together with brads while sawing them out on the band saw and while their edges are being smoothed on the sander.

The assembling need not be explained as it is clearly indicated in the drawing.

For finishing, either the conventional stain and shellac or varnish, two coats of flat paint and enamel, or a brush or spray gun lacquer may be used.

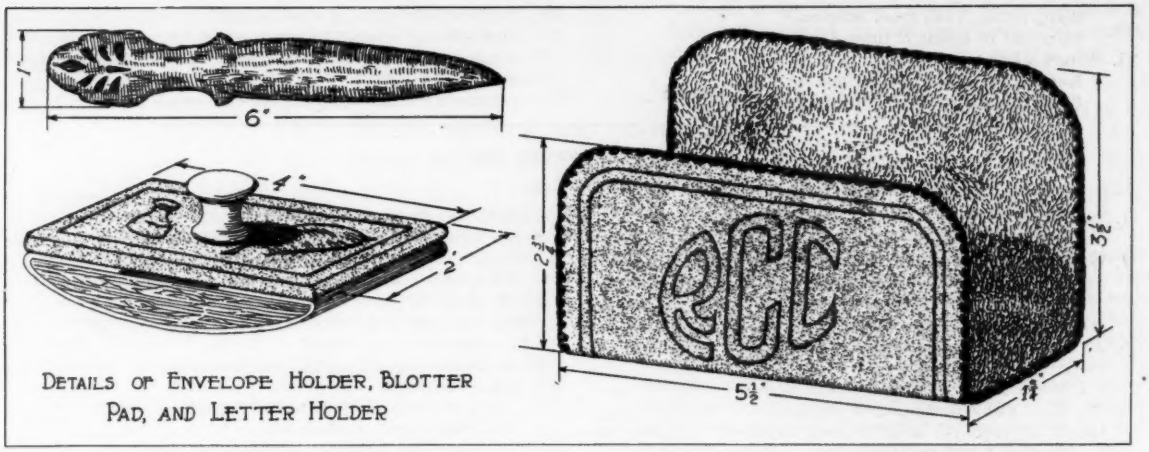
A LEATHER DESK SET

Ross C. Cramlet, Junior-Senior High School, Newton, Iowa

Leather desk sets are very popular with teachers, secretaries, or people who spend a great deal of time at a desk.

The set shown herewith is mounted upon presdwood. This

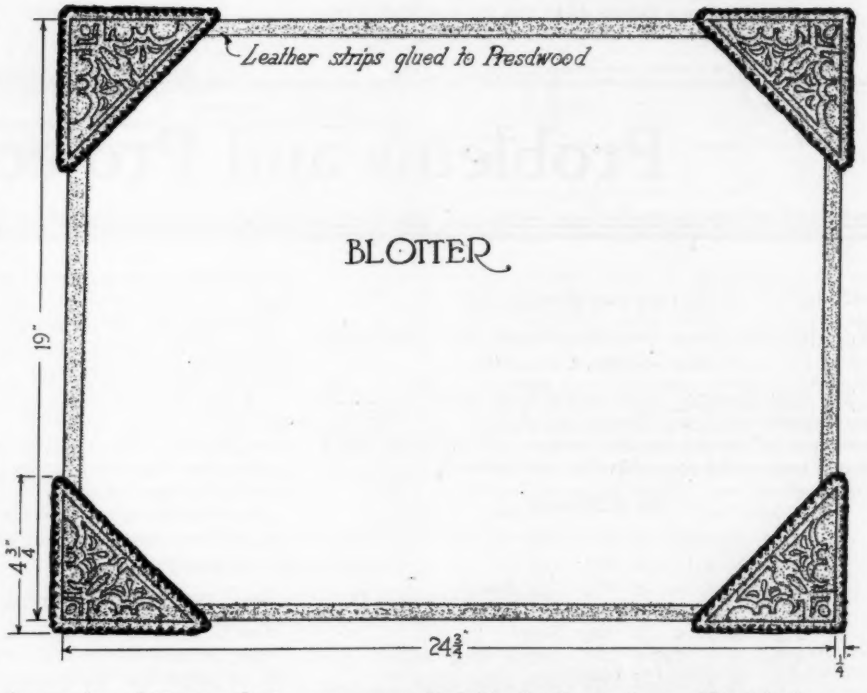
The leather desk set



DETAILS OF ENVELOPE HOLDER, BLOTTER PAD, AND LETTER HOLDER

is an original idea and has proved very satisfactory, due to the fact that ink or blotches may be cleaned off readily. The thickness of the presdwood used is 3/16 inch, with the smooth surface up. The corners may be dressed a little with a plane on the back side so the leather fittings will appear more neat. In order to get the 1-in. leather strip around the outer edge to stick, the presdwood must be roughened with a knife. Ordinary cold glue is used to hold the strips and will work satisfactorily provided pressure is applied.

The corner designs are made of calfskin. They should be tooled and laced before they are placed on the board, using a small bit of glue on the underneath flap so they will not slip off. A much more snug fit may sometimes be obtained if the leather is wetted and stretched on the corners so it will set.



The envelope holder is made from a piece of 20-gauge sheet iron with a calfskin facing and a suede lining on the inside. The shape and size of this may be made to suit the individual. However, care should be taken not to make it too large. The article may be all made up before the tooling or stamping is done on the leather as the metal background is ideal to tool over. The blotter pad is made of two pieces of wood as shown in the drawing. The knob is a round drawer pull and can be purchased from any cabinet-fixture company.

The letter opener may be made of hammered copper, or of celluloid. However, celluloid with a laced leather handle to match the other articles is very attractive.

Many good suggestions for designs of this complete set may be found in Lester Griswold's *Handbook of Designs*.[1]

This set when completed is very attractive and it will find a definite place in any home or office.

SCENERY CONSTRUCTION

H. B. Kellam, Phineas Banning High School, Wilmington, California

The construction of scenery, props, and sound effects are the big problems which face all public and theatrical school-stage crews. Probably the first to be considered is the construction of the "flats" which form principal pieces of scenery used on the stage. Flats are defined as framed pieces of scenery covered with scenery canvas which are painted to give the effects of different types of settings. Flats vary in height and width, the usual standard of interior settings being from 14 to 16 ft. in height, width running from 12 in. to 4 ft. for "jogs," which are small flats, and up to 5 ft. 9 in. in width for plain wings, doors, windows, fireplace pieces, etc. Large arches or other pieces of greater width are usually constructed in two pieces hinged together in the center so that they may be folded for transportation or for storage. The maximum width allowable for pieces that will be transported from place to place is 5 ft. 9 in.

The first step to be considered in the construction of flats is the type of joints to be used. This depends upon whether they are to be temporary or permanent and how much may be expended upon them.

The best type of joint to use in all construction work is the mortise-and-tenon joint. It is the strongest, neatest, and most durable joint.

A cheaper type of joint construction is the dowel joint. It gives a neat, durable, and fairly strong construction joint for

[1]Published by L. Griswold, Colorado Springs, Colorado.

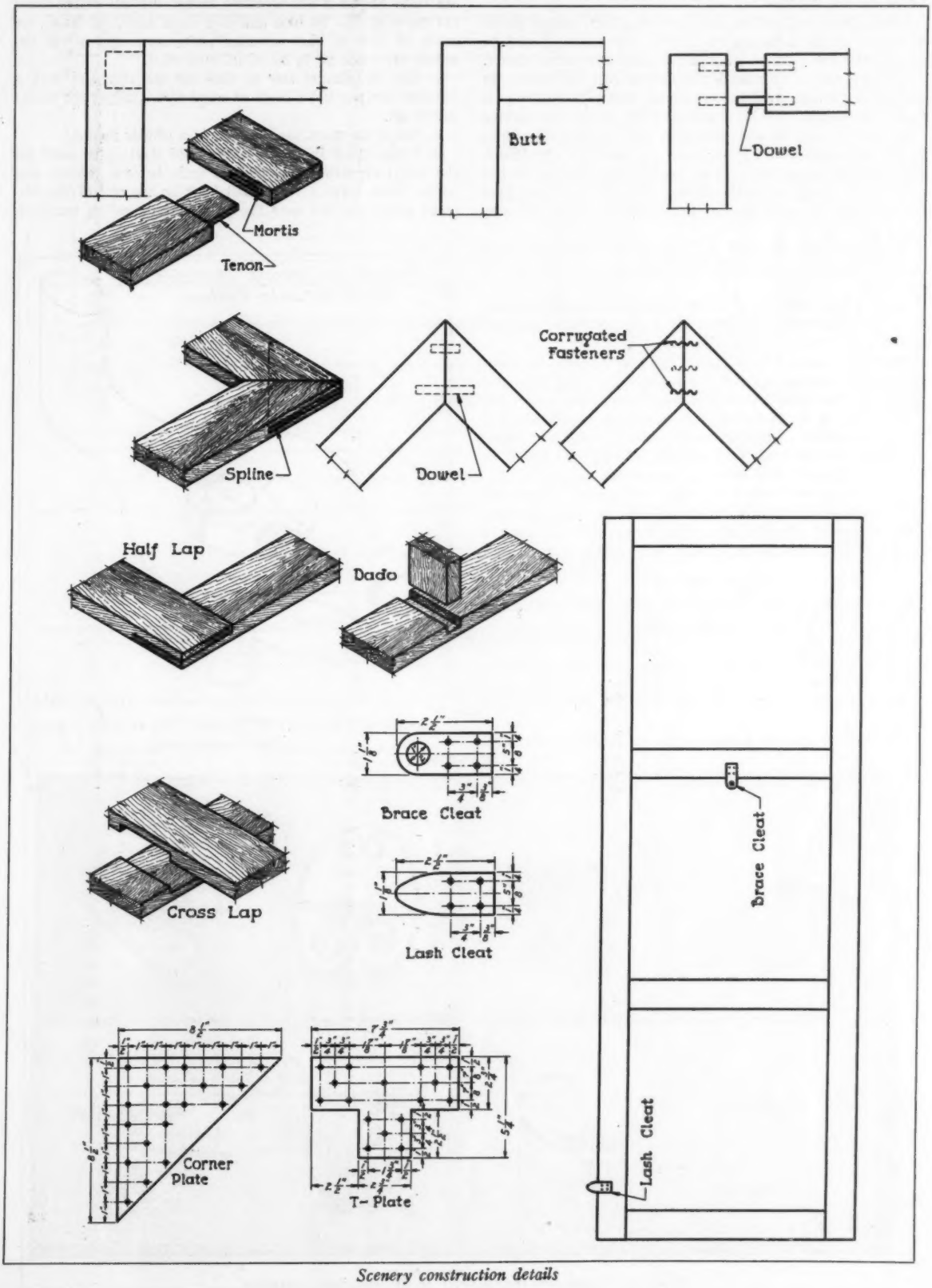
some types of work or scenery, when props are temporary.

The miter or picture-frame joint may also be used on some types of props. It may be held together by a spline, dowels, or with corrugated nails, or corner pieces nailed on the back.

The half-lap joint (dado, gain, or cross-lap joint) is an excellent joint for rough construction work.

The butt joint is very weak and produces very poor, unworkmanlike jobs.

The available funds will largely govern the selection of the wood for the framework of the flats. Sugar pine is the best



Scenery construction details

wood to use, but it costs double the price of Oregon pine. When ordering Oregon pine, be careful to select only good straight-grained lumber so that the flats built of it will stand the rough handling to which stage scenery is subjected. To take care of both strength and lightness, it is well to use 13/16 by 3-in. lumber.

After gluing and nailing the frame together, corner plates or braces of ¼-in. veneer or 1/16-in. sheet iron should be placed over the back of all joints to keep the frame square.

The next step is to stretch the canvas over the frame. Be careful to prevent wrinkles or sagging spots. If economy is necessary, muslin may be substituted for canvas. In tacking down the canvas, do not stretch it too tightly. The tacks should be placed about ½ in. from the inside of the frame. They may be spaced about 3 in. apart. After the canvas has been tacked along the entire frame, that portion which projects beyond the tacks should be fastened to the frame with heavy glue size.

The brace cleat is made of ⅛ by ¾-in. band iron. It is fastened at the center of the lower cross arm, at the rear of the frame.

Make a lash cleat out of ⅛ by ¾-in. band iron and fasten it to the upper right-hand rear corner of the frame, approximately 6 in. from the top of the frame.

The canvas must be sized to fill the pores, before the color or scenery may be applied. To prepare the size, take one pound of clear flake glue and cover it with cold water. Let it stand for 12 to 24 hours. Then place the can in which it has been soaking in boiling water and add to it one gallon of warm water, and stir well. Enough whiting also should be added to give body and color to the coating.

The scenery may be painted with dry pigment color mixed with water, to which is added enough size to make the color adhere smoothly. Dry pigment color makes the best and the cheapest paint for use on scenery flats, props, and the like.

ASH TRAYS

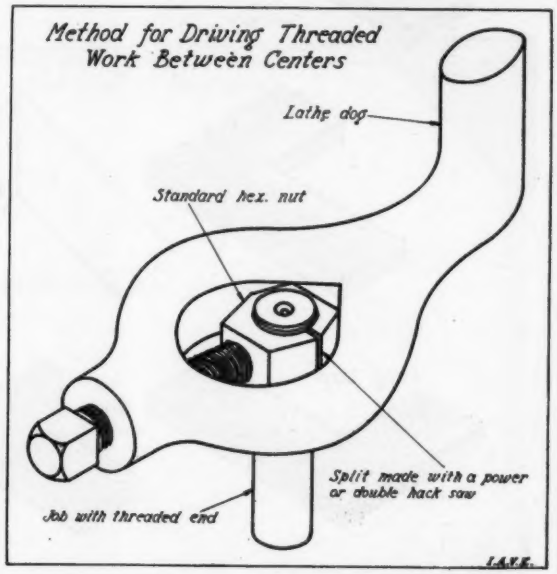
H. M. Andersen, J. S. Morton High School, Cicero, Illinois

The ash tray makes a very appropriate problem for the beginner in metal work. It arouses and holds the student's interest, gives him an opportunity to do some original designing, serves as an introduction to quite a number of different processes, and when properly finished makes a very acceptable gift.

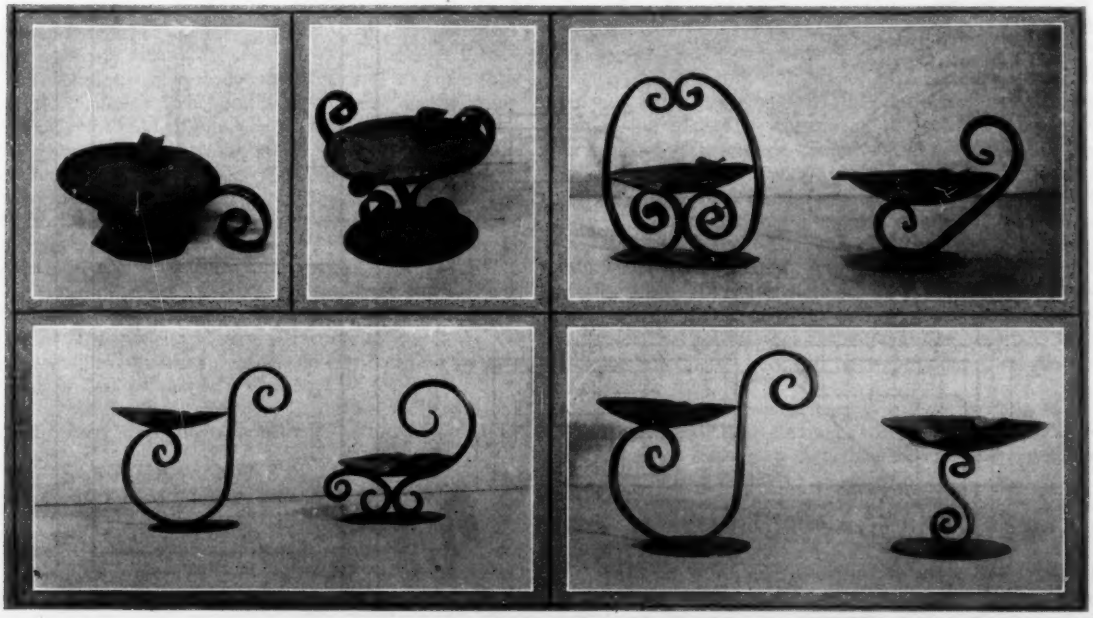
The student must first make a design. After this has been O.K'd by the teacher, the scrap material on hand is carefully checked over to see whether it contains material that may be used for the project. This method assists in keeping down the quantity of new material used.

Because of the variety of designs, the material list for the ash trays shown is not standard except that all of the trays are made of No. 24 blue annealed sheet steel. All bases are made of No. 20 blue annealed sheet steel, and all of the scrolls are made of ⅛ by ⅜-in. mild steel.

1. Cut the desired size of disk for the tray and with a forming hammer and a block of wood dish it as per the design submitted.
2. Shape the piece for the base in a similar manner.
3. Forge down the ends of the mild steel to be used for the scroll or scrolls so that the ends become thinner and wider. Next, forge a very small hook on the end of the material which just fits over the head of the scrolling template.


Method for Driving Threaded Work Between Centers
Lathe dog
Standard hex. nut
Split made with a power or double hack saw
Job with threaded end
I.A.V.E.

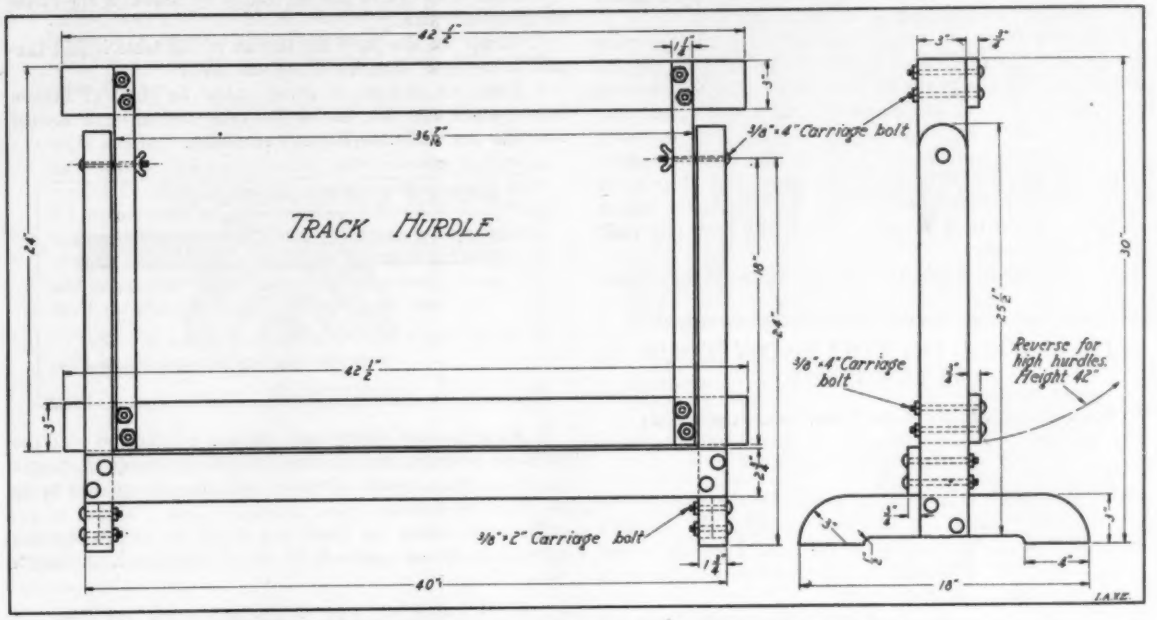
Contributed by Frank D. Rohmer, Lincoln High School, Midland, Pennsylvania



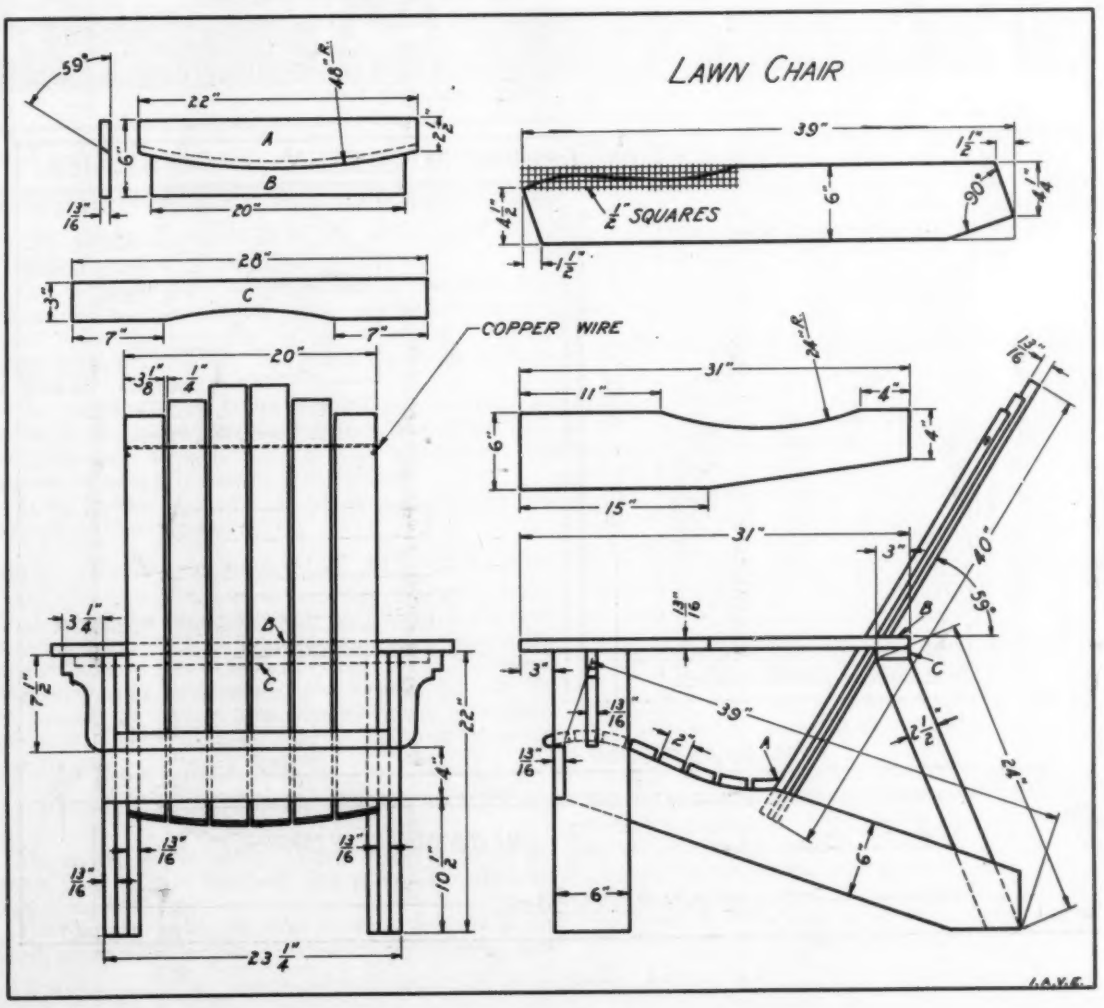
Ash trays designed by the students. H. M. Andersen, instructor

After the scroll at one end is formed over the template, reverse the piece and repeat the operation on the other end so that the entire piece resembles the letter S.

4. Spot-weld the tray and the base to the scroll, using the acetylene torch.
5. Polish with emery cloth and apply a coat of clear lacquer.



Track Hurdle Designed by M. L. Klein, High School, Naperville, Illinois



LAWN CHAIR

E. W. Baxter, Kansas State Teachers College, Pittsburg, Kansas

The lawn chair described herewith may be made of any cheap available lumber. In this way many of the fundamental woodworking processes may be learned at low cost.

The design of this chair may be altered so that lumber with dimensions other than those shown in the drawing may be used. It is preferable to assemble the entire chair with screws, but nails may be used in some cases. One of the outstanding features of the design presented is that the *back assembly* can be removed from the *seat and arm assembly* by removing the screws at A, B, and C. This permits the chair to be knocked down for storage and shipment. The heavy copper wire through the back permits curving the back and adds strength and beauty.

The chair may be finished to suit the wishes of the student who builds it.

HOW WELL DO YOU KNOW YOUR TRIANGLES?

D. E. Kellogg and W. A. De Vette, Erie, Pennsylvania

(See Supplement No. 266)

While all teachers undoubtedly explain the use of the drafting triangles, it is not very easy to judge the student's familiarity with the various combinations. The supplement accompanying this brief article is self-explanatory and a check list of the correct answers follows:

A = 30°	F = 60°	K = 75°	P = 120°	U = 15°
B = 90°	G = 120°	L = 135°	Q = 45°	V = 75°
C = 60°	H = 45°	M = 75°	R = 15°	W = 15°
D = 120°	I = 45°	N = 105°	S = 15°	X = 105°
E = 105°	J = 90°	O = 30°	T = 60°	Y = 75°
				Z = 105°

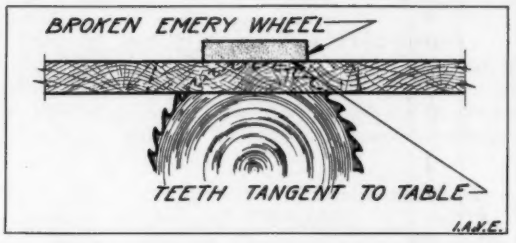
A SAFE METHOD FOR JOINTING A CIRCULAR SAW

Maurice L. Bullard, Harney County High School, Burns, Oregon

Circular saws can be jointed readily by following the method given herewith:

1. Lower the saw until the surface of the table is just tangent to the outer diameter of the saw teeth.

2. Place an oilstone or emery stone (a piece of broken emery wheel will do), flat on the table and move it around over the saw while the latter is revolving.



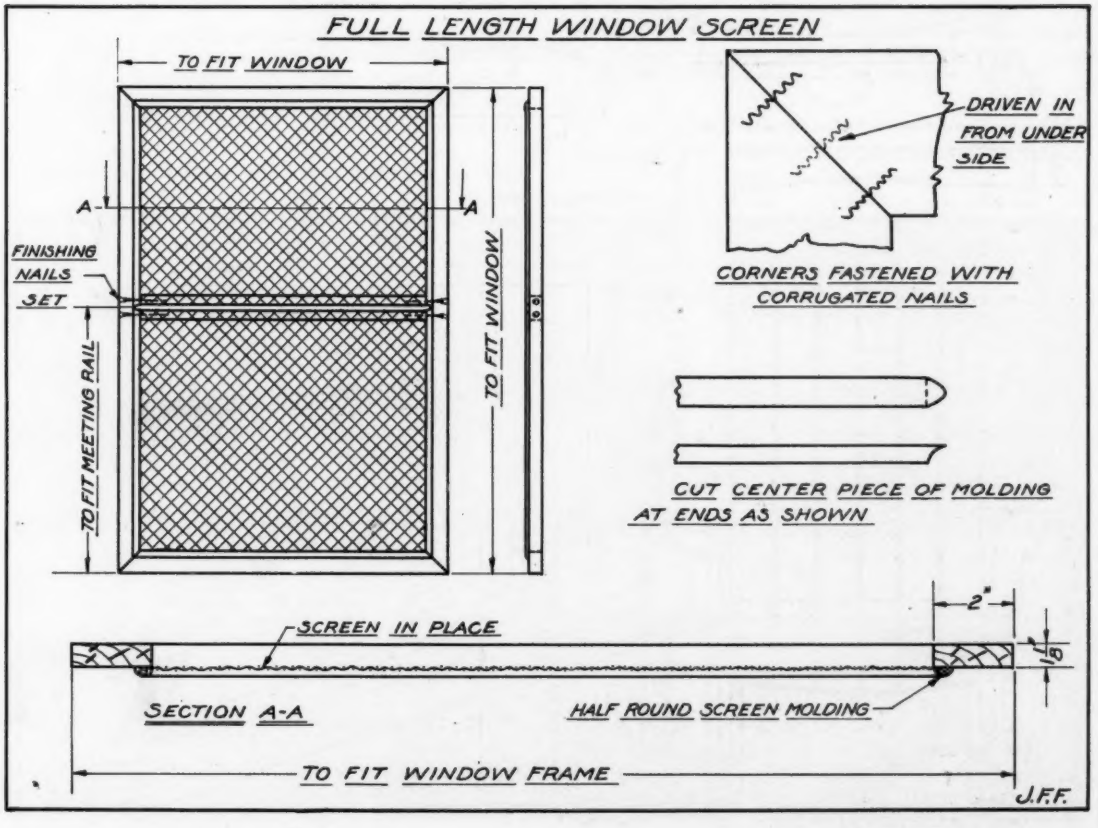
3. Raise the saw slightly and continue grinding off until the teeth are properly jointed. This method eliminates all danger to the operator, insures accuracy, and prevents grooves being cut into the stone.

The writer does not claim any credit for originating this method, as he was taught it by Mr. E. D. Meyer, at Oregon State College.

FULL-LENGTH WINDOW SCREEN

John F. Faber, New York City, New York

The window screen is a good problem for the beginner in woodwork. The one shown in the accompanying illustration is easily constructed, economical, substantial, and looks as good as any screen made. The simple construction might interest general-shop instructors.



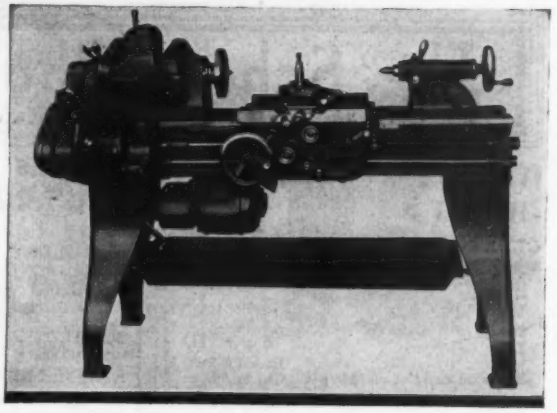
FROM ONE WHO KNOWS

"In twenty-five years of experience I have operated lathes in a school and in commercial machine shops—have been a teacher in an industrial school and a machine designer.

"As a designer I can appreciate the features, advantages and high quality of the Rockford Economy Lathe. As a teacher, I know that this lathe provides everything needed for clear, practical, accurate instruction in modern engine lathe practice. As a machinist, I know that Rockford Economy lathes are popular in a large number of commercial shops, where they are used in tool rooms and production departments. As a student, I know that this lathe is simple, easy to operate, and safe.

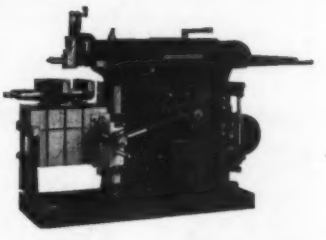
"It will be a pleasure to give additional information to anyone interested."*

**Name on request*



The Special Rockford Economy Lathe, illustrated at upper right, has all the advantages noted above. In addition, we have found a way to include a direct-connected multi-speed motor drive in its standard equipment without exceeding the remarkably low price of Rockford Economy Lathes. Write *today* for description, specifications, and prices.

The Rockford Hy-Service Shaper, shown at right, is an equally accurate, simple, durable, safe tool. It is widely used in commercial shops and priced within the most thrifty school budget. Write for circular.



ROCKFORD MACHINE TOOL CO.

. . . . LATHES . . SHAPERS . . SHAPER-PLANERS

ROCKFORD, ILLINOIS, U. S. A.

Associations, Conventions

CENTRAL CONNECTICUT INDUSTRIAL-ARTS ASSOCIATION

The newly formed Central Connecticut Industrial-Arts Association has held two meetings at Hartford. It was decided to hold the annual meeting for the election of officers during the month of January, and to hold three other meetings in cities near Hartford.

The present officers of the organization are: President, Walter F. McAndrews, Hartford; vice-president, John Houdlette, Meriden; secretary, Harry A. Barnicle, Hartford; and treasurer, Linwood E. Harmon, West Hartford.

At the meeting on Friday, March 31, a constitution was adopted. — *Harry A. Barnicle.*

WISCONSIN VOCATIONAL ASSOCIATION

The officers of the Wisconsin Vocational Association elected for next year are: President, Mr. L. H. Wochos, Green Bay; secretary-treasurer, Jacob Spies. Members of executive committee, Mr. A. V. Miller, Richland Center; Mr. H. M. Winkel, Milwaukee; Miss M. Elizabeth Geve, Fond du Lac; Mr. R. H. Langdon, La Crosse; Miss Dorothy Patten, Milwaukee; Mr. O. H. Johnson, Madison; Miss Jennie Turner, Madison; and Mr. Marion W. Smith, Appleton.

PEORIA INDUSTRIAL-EDUCATION CLUB MEETING

The monthly dinner meeting of the Peoria Industrial-Education Club was held March 13. The principals of the local high schools were guests.

The principal speaker, Mr. Fred Streibich, president of the Peoria school board, explained the board's pay-as-you-go plan for operating the city schools. He pointed out that no serious curtailments had been made and that the schools are not operating in the red at the present time.

Mr. Merle Rerie, of the Columbia Junior High School, gave an interesting talk on the industrial-education program in the Philippine Islands where he had formerly been a high-school principal.

The next meeting of the club will be held at the Thompson Inn, Pekin, on April 10. — *F. L. Barloga.*

ANNUAL INDUSTRIAL-ARTS EXHIBIT

The third annual industrial-arts exhibit of New York City will be held on May 6 at the School of Education, New York University, Washington Square, New York City. At this exhibit work from the industrial-arts departments of the various schools will be shown. The aim of the exhibit is to establish a closer friendship between the instructors and the students of the various schools.

A number of new features which will be helpful to teachers and students alike have been added this year. Manufacturers also have been invited to display their lines of tools, materials, and machines.

TEXAS VOCATIONAL ASSOCIATION MEETS AT FORT WORTH

The Texas Vocational Association held its annual meeting at Fort Worth, in connection with the State Teachers' Association.

Among the topics covered at the meeting were outlines of work for the junior high school, administrative economies, reducing pupil costs, and the relation of the junior high school and the state department.

Officers elected for the year were: President, Prof. E. L. Williams, College Station; first vice-president, J. L. Owens, Pilot Point; second vice-president, C. G. Grove, Commerce;

(*Continued on page 9A*)

The School Shop Shopping Guide

HOLD-HEET GLUE POTS $14.00 and up

Run a 30 Day Test

1 qt....$14
2 qt....$17
4 qt....$24
8 qt....$36

115 or 230 Volts. Sold by Jobbers.

Run a 30-day test on this pot produced by world-famous laboratories. See how it maintains temperature to 1 degree; saves glue, electricity and time, why within a few years it became the standard pot of industry, Run a test, then if you don't want it, send it back, Your jobber or

RUSSELL ELECTRIC CO.
364 W. Huron St., Chicago

CHANGE ATTACHMENTS *Instantly*

CARVE, DISC, DRILL, GRIND, POLISH

A REAL TOOL— *Not a Toy*

MASTER BENCH HEAD BUILT TO LAST A LIFETIME

Each attachment is mounted on a mandrel and is in perfect alignment. To change attachments, merely loosen handwheel and slip into draw-in collett. List price $4.00.

Special Offer: Send $3.00 for Master Bench Head postpaid or C. O. D. We will send you FREE one 4"x ¾" all-purpose grinding wheel and 4" buff mounted on separate mandrels. Write for booklet.

Let us quote you on grinding wheel specifications

WISCONSIN ABRASIVE COMPANY
Dept. 8575 Station A Milwaukee, Wis.

Write for a copy NEW CATALOG

TRADE MARK "Jorgensen" REG U S PAT OFF

HANDSCREWS and STEEL BAR CLAMPS

ADJUSTABLE CLAMP COMPANY
424 N. Ashland Ave. Chicago, Ill.

Keeping Up-to-date on Adhesives

THE manufacturers of CASCO GLUE (dry powder cold-water-mix casein glue) offer these facilities, *free of cost,* to Shop Instructors.

- **FREE SAMPLES OF CASCO**
  The regular CASCO Waterproof Glue or the new CASCO No. 2 White (stain-free) Glue.
- **FREE BOOKLETS AND BULLETINS**
  CASCO GLUING GUIDE—50 pages—75 illustrations—over 50 uses for CASCO Glue—and how to make Waterproof Crack Filler.
  GLUING JIG-SAW PUZZLES—new 4-page bulletin.
- **MAILING LIST**
  Free listing to receive "The CASCO Idea" (bi-monthly), also "The CASCO Red Book," a manual of factory gluing practice.

FILL IN AND MAIL COUPON

THE CASEIN MFG. CO. OF AMERICA, INC.
205 East 42nd St., New York, N. Y. I.A.-5-33

Send me free sample of
CASCO Waterproof Glue ☐ CASCO No. 2 White Glue ☐ Please check which desired
also
"CASCO Gluing Guide" ☐
"Gluing Jig-Saw Puzzles" ☐
and
Place my name and address on mailing list as follows:

*Name*_____
*Street*_____
*Post Office*_____
*School*_____

They STAY SHARP

Murphy Knives are made that way. Over 83 years of experience, research and experimentation have given us the knack of making knives to specifically meet your needs. For manual training, sloyd, stencil or wood block work, there are none finer. The best steel, hand honing and expert finishing cause Robert Murphy knives to STAY SHARP.

Illustrated is our No. 1 Sloyd Knife. Blade is 2⅝ in. long.

See the complete line in our catalog.

ROBERT MURPHY'S SONS CO.
AYER, *Established 1850* MASS.

SUPPLY SERVICE

In Leather, Metal, Celluloid, Wood Carving, Batik, Rope and Cordage; also Primitive Indian Crafts for the Educational, Recreational, and Occupational Fields.

HANDICRAFT MANUAL
300 Projects, 400 Illustrations, Price $1 Paper—$2 Cloth. Sent on Approval. Price List on Request

HANDICRAFT SPECIALTIES
TOOLS - MATERIALS - INSTRUCTIONS
LESTER GRISWOLD
COLORADO SPRINGS, COLORADO

JIGSAW PUZZLE SUPPLIES

We are supply headquarters for puzzle enthusiasts throughout the country. Special Plywoods, stainless glue, boxes, saw blades, special garden patterns. Send 3c for list.

Complete Supplies at Unbeatable Prices

H. L. WILD
Dept. C 3, 510 E. 11 St., New York, N.Y.

Printers Supplies

Safety appliances for Platen Presses; Gideon Grippers; Ink Rollers; Complete Printing Plants—Outfits for schools or students. Write for catalog. Another source of supply

Globe Type Foundry, Est., 1904
523 SOUTH GREEN STREET CHICAGO ILLINOI

INLAY—THE ART OF INLAYING IS A NECESSARY PART OF A COURSE IN WOODWORKING.

Pamphlet on history and method of inlaying with complete catalogue of designs and 45 actual samples. Special to schools—25c (regular $1.00), refunded with orders.

Marqueterie Corporation
192 Lexington Ave. New York, N. Y.

INSTRUCTION SHEETS

UNIT SERIES I. WOODWORKING—Ten Instruction Sheets (Black on White Prints) on common operations.
INTERMEDIATE PROJECT SERIES VIII—Six Projects on Ten Sheets. Table Lamp, Smoking Stand, End Table, Pier Cabinet, Book Case, Priscilla Sewing Cabinet. New Designs. $.35 per set, 4 sets $1.00, 10 sets $2.00. May split sets. Prices too low to be able to send samples. Money order preferred.
Clifford B. Smith, 294 Hastings St., Buffalo, N. Y.

Inks for Raised-Writing in Gold or Silver
COMPOUNDS For RAISED-PRINTING
SHOW CARD WATER-COLORS - PRINTING INK
RUBBER STAMP INKS - WRITING INK POWDERS
EQUIPMENT for THERMOGRAPHY PRINTING
Write for free Catalogue and Specimens to,
The A. Stokes Co., Hudson, Ohio, U.S.A.

ART METAL *and* JEWELRY WORK

Equipment and Supplies

Tools of all kinds for Jewelry, Silver, and Copper, Rose Hammers and Anvils. When ordering be sure to

SPECIFY "ROSE"

Gold, Silver, Copper, Brass, Pewter, and Nickel Silver in sheet and wire form. Semi-Precious stones. Send for our catalog B. Ask for a sample copy of our Brochure, "Things In and About Metal," sent free.

METAL CRAFTS SUPPLY CO.
Providence, R. I.

INSTRUCTIONAL UNITS IN WOOD FINISHING

By McGee and Brown

It solves your finishing problems.
$1.60

Bruce—Milwaukee

(Continued from page 7A)

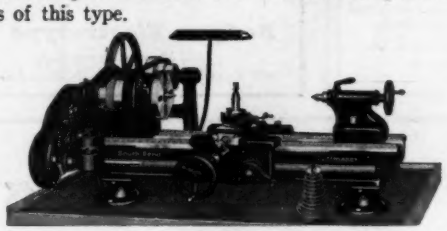
third vice-president, Leona Wallis, Houston; secretary, Mrs. Gladys Hudnal, Austin.

The several sectional groups also elected officers as follows: Industrial Arts, president, Prof. Sam Martin, Austin; secretary, Albert McLeland, Fort Worth; Industrial Education, president, C. G. Dodson, Dallas; Trade and Industry, President, J. E. Schiebel, Dallas.

SchoolShopEquipmentNews

NEW TOOLMAKING LATHE FOR METAL CUTTING

The South Bend Lathe Works, of South Bend, Ind., has just announced a new, accurate, simplified, metal-cutting bench lathe, which, because of the introduction of radical manufacturing economies is sold at a new low price for machines of this type.



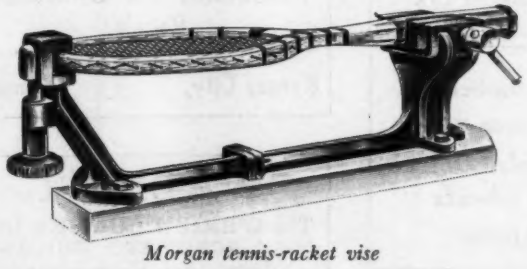
South Bend toolmaking lathe

This new bench lathe, the result of two years' study on the part of the firm's engineers, is of the back-geared, screw-cutting type. It has a 9-in. swing, is mounted on pedestal-style legs, has a triple V-way bed, and is equipped with a ¼-horsepower motor to operate a horizontal drive, which may be mounted on the bench or affixed to the wall. The motor-control switch is conveniently attached to the lathe bed at the extreme left end of the lead screw. The lathe may be equipped with countershaft drive if desired.

The lathe will handle machining and grinding operations, will cut standard screw threads from 4 to 40 per inch, takes care of straight and taper turning, boring and reaming, drilling, cutting-off, buffing, grinding, and polishing operations, and can be equipped with attachments for milling, keyway cutting, and other special work.

TENNIS-RACKET VISE

The Morgan Vise Company, 108 N. Jefferson St., Chicago, Ill., is marketing a new Morgan tennis-racket vise. It is made so that any racket, no matter how long its handle may be, can be securely held while the stringer is at work on it. The vise holds the racket rigidly and allows 7 in. of clear working space underneath.



Morgan tennis-racket vise

The vise is made of cast iron, strongly ribbed and made very substantial throughout. To set up the vise it is necessary only to bolt it to the top of the workbench or to an extension plank.

NOTHING LESS
than the BEST TEXTS
in the HANDS of EACH PUPIL

will promote maximum efficiency and maximum economy in teaching Vocational and Industrial Arts Subjects.

Recently published under the supervision of the National Vocational Guidance Association

PRINTING TRADES AND THEIR WORKERS.
By F. E. Clark, International Textbook Co., Scranton, 1932. Cloth, 5x8 in., 132 pp., illus., tables, $1.40.

"The monograph is intended as a guide to young people who are considering printing as a vocation. The scope of the printing industry, the work of the compositor, pressman, binder, stereotyper, photoengraver, and other craftsmen, is simply yet admirably described, and the qualifications necessary for each occupation, the opportunities, and rewards are discussed."

Review appearing in Journal of "Mechanical Engineering", Feb. 1933

Catalog of books sent on request.

INTERNATIONAL TEXTBOOK CO.
Box 8907-D, Scranton, Penna.

PLURALITY OILSTONE TOOL GRINDER
Meets School Shop Needs

Now Available in 3 sizes

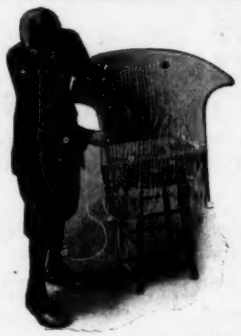
No. 475 PLURALITY

Here is the most efficient, serviceable and convenient tool sharpening machine ever made. Now in three sizes to suit every need. Combines five basic units in one: *Coarse oilstone wheel, fine oilstone wheel, grinding cone, leather stropping wheel, and emery wheel*—Compact—Easily Accessible. Especially guarded for school shop use. Has ball bearing direct motor drive.

Write for detailed information.

MUMMERT-DIXON CO.
HANOVER, PA.
Originators and Pioneer Manufacturers of Oilstone Tool Grinders

The School Shop Shopping Guide



Furniture Weaving

« Meets the Demand for Lowered Costs »

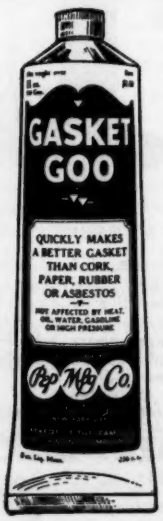
Offers more real training value than any other medium devoted to the coordination of mind and muscle.
No special equipment or power required. One hundred per cent handwork. Results are quick and positive. Hundreds of schools finding it the most timely and economical hand training activity. Detailed instructions accompany each design.

Send for this 1933 Catalog

It tells you all about furniture weaving and illustrates over 100 practical projects your classes can make.

Address Department A
Grand Rapids Fibre Cord Company
609 Myrtle Street
GRAND RAPIDS, MICHIGAN

FREE SAMPLES
for teachers of auto mechanics and their students
Teachers: How many students have you?


GASKET GOO
QUICKLY MAKES A BETTER GASKET THAN CORK, PAPER, RUBBER OR ASBESTOS
NOT AFFECTED BY HEAT, OIL, WATER, GASOLINE OR HIGH PRESSURE
Pep Mfg. Co.

Write
PEP MFG. CO.
INCORPORATED
33 W. 42nd St.
New York

ETCH NAMES ON TOOLS
(TYPEWRITTEN)
by the process of Type Etching. Simple, easily done, inexpensive, permanent. For information address
THE TYPE ETCHING CO.
209 Pine St. N. E., Atlanta, Ga.

Materials for Brush Making
Brush Fibres, Tampico, Fibre Mixtures, Sterilized Horse Hair, Hair, Bristle and Tampico mixtures solid or taper stock, original lengths cut to size. *Samples matched.*
E. B. & A. C. WHITING CO.
Burlington, Vermont

ELECTRO-TYPERS

Especially qualified to be of service to the school printshop.

Promptness and quality assured.

Forms returned same day received.

Badger Electrotype Co.
600 Montgomery Bldg.
407 East Michigan St., Milwaukee, Wis.

»» Lumber ««

BUDGET-SUITED LUMBER ORDERS
. . . *Large or Small* . . .

Small lot lumber is our specialty. We have no catalog. Let us know your needs and we'll provide just the right size and kinds of domestic or foreign woods to meet your school shop requirements. Well seasoned—highest grades. Teach your students efficiency and economy by example.

Delivered to your door anywhere.

VOLK CONTRACTING AND SUPPLY CO.
8523-122nd Street Dept. 1
RICHMOND HILL, N. Y.

KING
Quality Manual Training Lumber
Northern and Southern Hardwoods
Air Dried or Kiln Dried
Write for Price List and Stock List
W. O. King Lumber Co.
2701 S. Damen St. Chicago, Ill.

T. A. Foley Lumber Co.
We Furnish Schools With
Lumber, Panels, Dowels and Cedar Chests
PARIS, ILLINOIS

HAND CRAFT PROJECTS
Book III By F. I. Solar
Cloth, 157 pages. Price, $1.25
The Bruce Publishing Co., Milwaukee

PAINTERS—DECORATORS « AND WOODFINISHERS »
GRAINING—Ancient and Modern
A complete and valuable treatise on the art of Graining. Materially extends woodfinishing information available in school shops.
140 Pages—59 Colored illus. Price $5.00 Postpaid Can be sent on 10 days approval.
William E. Wall
59 Union Square Somerville, Mass.

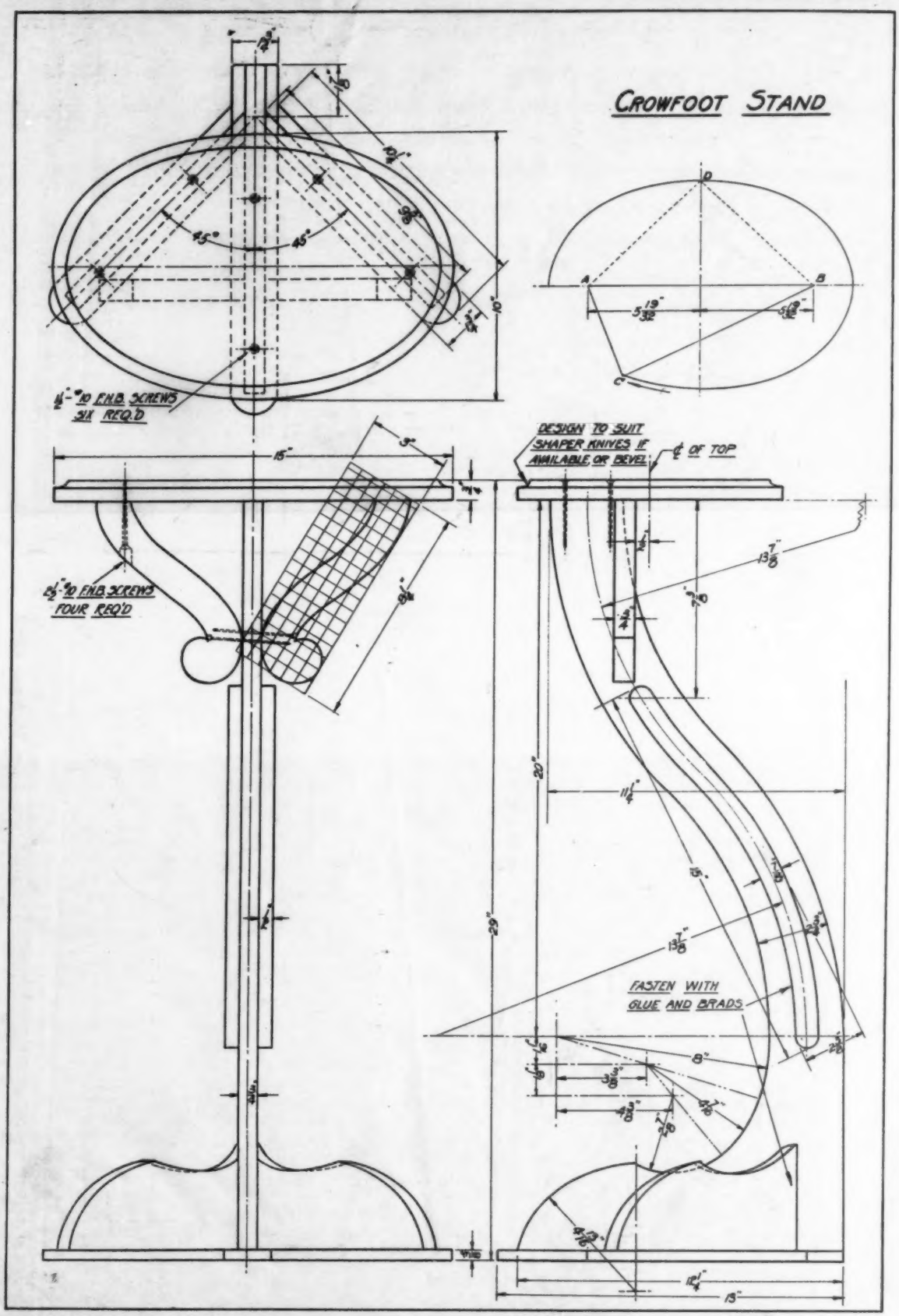
LUMBER FOR SCHOOL SHOPS
Whatever your need—Walnut, Cherry, Mahogany, Maple, Oak and others.
Panels, Turnings, Cedar Chests, Inlays, Dowels, Decals, Hardware.
We can furnish lumber for projects in this and past issues of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION.
Send for list "M"
W. W. BRUST
BOX 1094, HUNTINGTON, W. VA.

Frank Paxton Lumber Co.
Hardwoods « » Softwoods
Panels
Kansas City, Kansas

WALNUT
The O'BRIEN LUMBER CO.
2655 S. ROBEY ST., CHICAGO
Operating our own kilns assures you of dryness. Deal with a house known a half century for Quality and Service.
DOMESTIC HARDWOODS
MAHOGANY

To be Reproduced for School Shop Use Only
Copyright, 1933, The Bruce Publishing Company

CROWFOOT STAND



Designed by W. A. DeVette, Erie, Pennsylvania

Described Elsewhere in This Issue

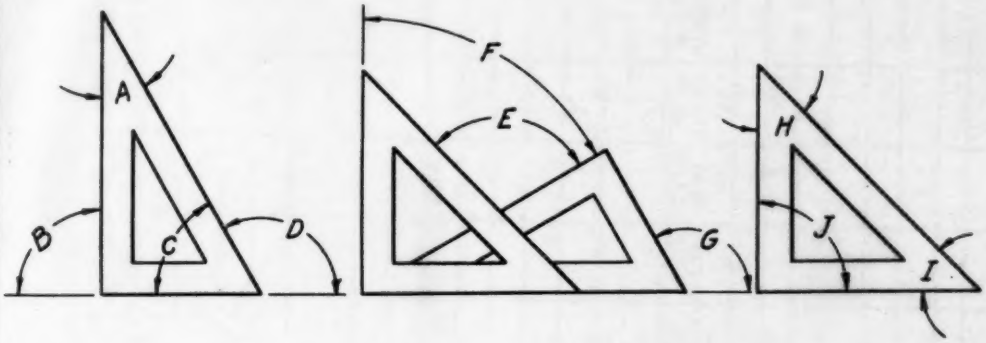
May 1933

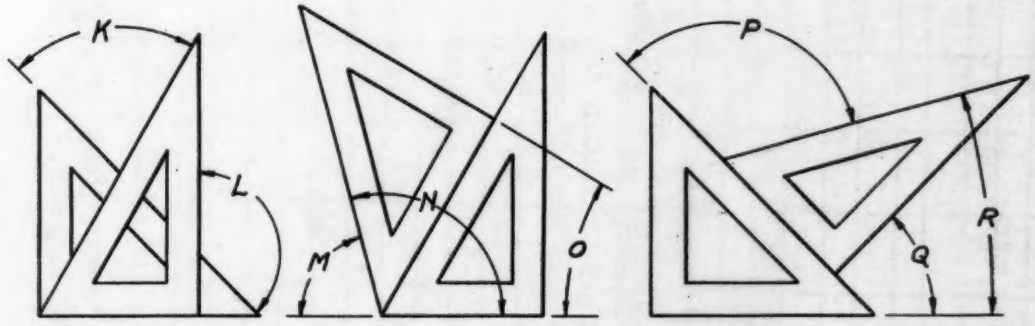
TRACING SUPPLEMENT, No. 266, MAY, 1933
INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

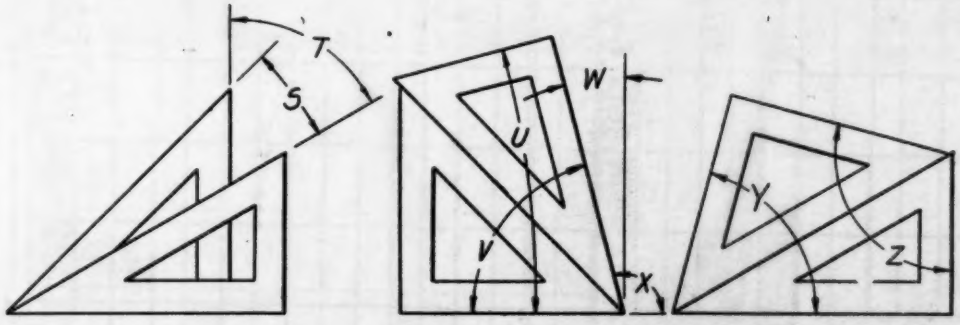
To be Reproduced for School Shop Use Only
Copyright, 1933, The Bruce Publishing Company

How Well Do You Know Your Triangles ?

On a separate sheet of paper write in a column the letters from A to Z. Examine the illustrations below, which are all possible combinations of the triangles used in drafting, and opposite each letter in your list write the number of degrees in the corresponding angle as indicated by the letters given.







Designed by D. E. Kellogg and W. A. DeVette, Erie, Pennsylvania